New Column By Scott Norman

HOT CoCo

A CWC/I PUBLICATION
JUNE 1985
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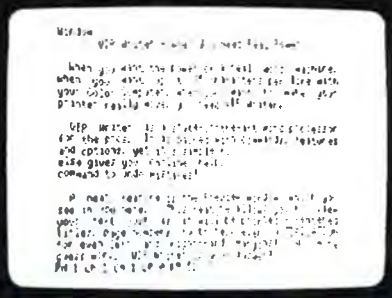

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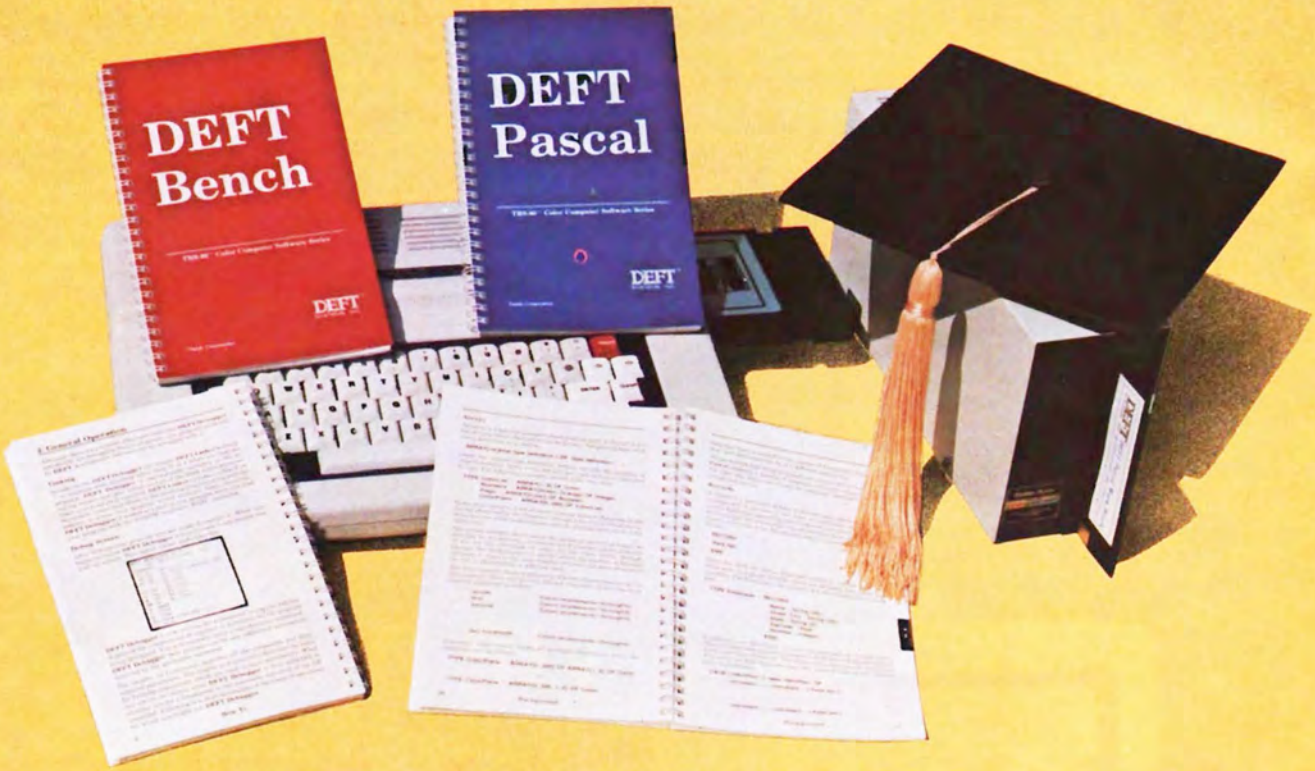

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HOT CoCo

Vol. 3. No. 1 June 1985

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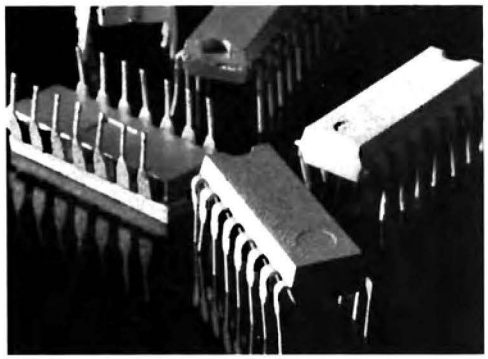

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HOT CoCo (ISSN 0740-3186) is published monthly by CW Communications, 80 Pine St., Peterborough, NH and additional mailing offices. Subscription rates in U.S. are $26.97 for one year, $38 for two years, and $53 for three years. In Canada and Mexico, $27.97—one year only, U.S. funds. Second class postage paid at Peterborough, NH and additional mailing offices. Canadian 2nd Class mail reg. #9564. Nationally distributed by International Circulation Distributors. Foreign subscriptions (surface mail), $44.97—one year only, U.S. funds drawn on a U.S. bank. Foreign subscriptions (air mail), please inquire. In South Africa contact *HOT CoCo*, P.O. Box 782815, Sandton, South Africa 2146. *All subscription correspondence should be addressed to* HOT CoCo, *Subscription Department, P.O. Box 975, Farmingdale, NY 11737. Please include your address label with any correspondence.* Postmaster: Send address changes to *HOT CoCo*, Subscription Services, P.O. Box 975, Farmingdale, NY 11737. Send Canadian change of address to *HOT CoCo*, P.O. Box 1051, Fort Erie, Ontario Canada, L2A5N8. Return postage guaranteed. Entire contents copyright 1985 by CW Communications/Peterborough, Inc.. For questions concerning your subscription and to place subscription orders, please call us toll free at 1-800-645-9559 between 9 a.m. and 5 p.m. or write to *HOT CoCo*, Subscription Department, P.O. Box 975, Farmingdale, NY 11737.

DIGRESSIONS

Our Second Anniversary, And A Look At Past And Present

This issue marks *HOT CoCo*'s second anniversary. It's been a n exciting two years. We've seen several major revisions to the Color Computer, including the 64K Color Computer, the CoCo 2, and the Korean-built models. We've also seen the TDP-100, MC-10, and Tano Dragon come and go.

There have been other comings and goings in those two years, as well. Software companies, large and small, have folded or pulled out of the CoCo market. But the lost support is more than offset by the greater number of new companies catering to CoCo users.

I started to count all the CoCo products available two years ago to compare that number with what was on the market now. It was a futile attempt. There are thousands of products available in an unbelievably wide range of applications. Funny how the general computer press says little of this.

Another thing you hear about in the general-interest computer magazines is the number of them that have folded—enough to make more than a few readers and advertisers nervous. The reason for this is focus; the whole personal-computer phenomenon is too big to cover in one magazine in more than the most general way. Only one of these magazines has a regular feature dedicated to Tandy computers, and not just the Color Computer at that.

System-specific magazines, such as *HOT CoCo*, are better positioned to give the readers what they need—the nuts and bolts about *their* computer. We think we have a pretty good future. But what does the future hold?

The Future

The two "big things" that need changing are the Color Computer's screen display and memory capacity. At least a 64-character-wide screen with true upper- and lowercase is necessary for serious word processing or spreadsheet use; 80 characters are preferred. Not long ago, 64K was the standard memory capacity on home computers. Now it is 128K, and it doesn't look like it will stay there long.

There are products that fix these problems, and we see these products gaining in importance to CoCo owners. Soon, the typical full-blown CoCo system will include the 128K upgrade, a monitor and driver, an 80-column card, Multi-Pak Interface, a bit-graphics printer, and at least one disk drive. Many software vendors will adapt their programs to take advantage of this setup.

What will the next version of the CoCo be like? We don't know; the folks at Fort Worth are very secretive about that sort of thing. We can guess that it will have at least true upper- and lowercase, address more memory, and make use of the OS-9 operating system. OS-9 is important because it can maximize on the extra memory, especially if bank switching is involved, and can be used as a means to maintain compatibility with older machines should a major change in board design be necessary.

We will cover OS-9 from a "working man's" point of view; i.e., we'll concentrate on using its utilities to manipulate files, economize on memory, and create macros. We'll also discuss other avenues that OS-9 opens for you, such as using non-Basic programming languages.

Education will become increasingly important as Tandy continues to push the CoCo to schools and the family. We see exciting new developments in educational software in the near future. Educators and parents are just starting to learn the most effective use of the computer as a teaching aid, and you can expect *HOT CoCo* to relate the latest discoveries to you.

My space is short, so I'll conclude with a promise that *HOT CoCo* will continue to provide the best programs and the best product evaluations available in any magazine. Here's to the next two years.—*Michael E. Nadeau*

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Instant CoCo is a cassette tape containing the major programs from this issue of *HOT CoCo*. Its purpose is to save you the time and effort of typing long program listings into your Color Computer. You simply load the programs from the Instant CoCo tape using your cassette recorder. The instructions for operating each program are found in the corresponding *HOT CoCo* article. Both Basic and Assembly-language programs are included on the tape.

The Instant CoCo symbol appears in *HOT CoCo*'s table of contents and on the program listing for each article with a listing used on the Instant CoCo tape. As an added extra, each tape also contains a never-before-published Bonus Program, complete with instructions.

The directory below lists all programs included on this month's Instant CoCo cassette. Shown first are the name of the article with a descriptive blurb and its author, followed by the page number in this issue where the article appears. Next comes the file name of the program on cassette. Finally, there is a brief description of the Color Computer system needed to run the program.

This month's Instant CoCo cassette is available for just $11.47, including postage and handling, from **Instant CoCo, 80 Pine St., Peterborough, NH 03458.** See our ad on p. 64 for more details.

Instant CoCo Directory June 1985

Side A

Article Name/Author/Description	Page #	File Name	System
Copyright Statement	---	TITLE	16K CB
Doctor ASCII/Esposito and Jackson Automatically execute machine-language programs from disk	18	PUTLDR	32/64K ECB
Mindbusters/Ramella Can you solve these three puzzles?	22	FIFTEEN BULLS CONSARN	16K ECB 16K ECB 16K CB
64K Modification Revisited/Esposito and Rowe Test your upgrade and enable your 64K of memory.	40	MEMTEST ENABLE	32/64K ECB 64K ECB
Missile Defense/McDowell and Diehl The aliens won't be so easy to stop this time.	44	DEFENSE2 DEFNSLDR	16K ECB 16K ECB
The 80K Color Computer/Grace Access your CoCo's hidden memory.	57	80K	32/64K ECB

Side B

Pie In The Sky/Riegel Create your own pie charts.	59	PIEGRAPH	16K ECB
Investment Analysis/Chakravarty Consult your CoCo before you invest.	62	INVSTMNT	16K ECB
Fabulous Fonts For The Gemini-10X/ Stoloff Generate custom character sets for this popular printer.	66	GEM-10X	16K ECB
How Your CoCo Adds Up/Tipps Learn binary and hex math.	70	BINARYOR HEXERCIS	4K CB 4K CB
6809 On Line/Ballard Give Vidtex a buffer.	78	BUFFTEXT	16K ECB

***** BONUS PROGRAM *****

High-Resolution Character Generator/ Bussell Put an alphanumeric character set on a hi-res screen.	---	GLETTER (m) DEMO CHARMOD	16K ECB 16K ECB 16K ECB

CB = Color Basic, DECB = Disk Extended Color Basic, ECB = Extended Color Basic
(m) = machine-language program (use CLOADM)

Back Issues

Yes, back issues of *HOT CoCo* are available for all months. This list shows the features in each issue:

June 1983—The CoCo word processor; a serial-to-parallel interface project; and the adventure, Cavehunt.

July 1983—How to upgrade your CoCo to 64K; cure video RFI.

August 1983—Speech synthesis via software; get more colors; build a color monitor driver.

September 1983—Disk utilities; hi-res character generator.

October 1983—Animation techniques; ROM disassembly, part I.

November 1983—Nuclear submarine simulation; ROM-pack primer; banner printer.

December 1983—World capitals quiz program; talking spelling tutor; vocabulary-building program.

January 1984—Programs for the businessman and investor; ins and outs of database management.

February 1984—CoCo-aided circuit design; simulate Extended Basic in Color Basic; change your CoCo's vocabulary.

March 1984—How a disk stores information; create your own wordsearch puzzles; dental/medical bill balancer.

April 1984—Peripherals buyer's guide; how to shop for a disk drive; disk-fix utility; Lisp interpreter.

May 1984—OS-9 review; financial transactions tracker; homebrew spelling checker; CoCo Reversi game.

June 1984—Horse-racing and stock-market simulators.

July 1984—Do-it-yourself lowercase mod; variable cross-referencer; the game, Python.

August 1984—Basic-09 review; database manager program; graphics tutorials; hurricane tracker.

September 1984—Educational software buyer's guide; typing-teacher program; the CoCo as a marketing aid.

October 1984—A collection of sounds for your CoCo; how to make programs auto-execute; printer spooler.

November 1984—Personal money manager program; disk-file protection utility.

December 1984—Disk-drive timer; disk drive maintenance tips; full-featured text-editing program.

January 1985—Spreadsheet program; stock-charting program; make fancy graphics with your printer.

February 1985—Drawing program; user's group list; Space Hawks game.

March 1985—Universal screen-dump program; POKE list; utilities.

April 1985—Telewriter-64 mods; modem comparison; satellite-tracking program.

You'll also find in each issue our regular features, reviews of popular software and hardware, and dozens of useful programs that are yours for the typing in.

Each back issue costs $3.50 plus $1 shipping and handling. On orders of 10 or more back issues, there is a flat $10 shipping fee. Send your orders to *HOT CoCo*. Attn. Back Issue Orders, 80 Pine St., Peterborough, NH 03458. ■

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How to Use HOT CoCo

Each month *HOT CoCo* provides program listings for you to type into your Color Computer and use. If you are new to computing, read this page for advice that will help you avoid problems often encountered when entering programs manually.

Know the Basics

Before you begin, you should be familiar with the basic operation of your Color Computer. Read the manual and make sure you understand how to enter a program line, save a program to cassette or disk, and make corrections to a program line. The Color Computer manuals are well written, and you will enjoy your CoCo much more if you've read them.

Check the Requirements

The first thing you should do is make sure that the program you want to enter will run on your version of the Color Computer. You need to know the memory requirements, the type of Basic used (Color, Micro Color, Extended Color, or Disk Extended Color Basic), what peripherals might be needed, and in some cases whether a particular ROM version is needed. (See below for an explanation of the different ROMs.)

All this information is provided in the System Requirements box included with each article that has a program listing. This box gives the minimum requirements to use the program. If, for instance, the box reads "16K RAM, Color Basic," the program should also work on 32K or higher, Extended or Disk Extended Color Basic CoCos.

Once you've established that the program will work on your CoCo, read the article thoroughly. Sometimes it will include information vital to typing in the listing.

What You See is What You Get

We print all Basic program listings 32 characters across—just as they appear on your video screen. Type in the listings exactly as it appears in the magazine, being particularly careful with spaces and punctuation. If you do this, the 32-character format will aid in proofreading what you have typed in by letting you match beginning and ending characters on corresponding lines. If you have a line that ends on a character other than what appears in the magazine, go back and check for a typo.

Common Errors

Some characters are easier to confuse than others when you are typing in program listings. And since your Color Computer interprets everything literally, the smallest error can crash a program. Below is a list of characters commonly confused with one another:

zero and the letter O
colon and semicolon
lowercase l and the numeral one
uppercase B and the numeral eight

Weird Characters

The up arrow indicates exponentiation on the Color Computer. Unfortunately, most printers do not have an up arrow. Our printer prints a caret (^) instead. Be sure to type an up arrow in place of all carets in Basic program listings.

Assembly-Language Listings

HOT CoCo often publishes programs written in Assembly language rather than Basic. Assembly listings "talk" to your computer on a much more direct level; Basic requires some translation before your CoCo can execute it. Therefore, Assembly works much faster than Basic. Unfortunately, it is more difficult to learn Assembly-language programming than Basic programming.

But you do not need to know how to program in Assembly to use these programs. You do need, however, something called an editor/assembler. An editor/assembler allows you to manually enter an Assembly listing, and then it "assembles" it into a form that your CoCo can execute. Since editor/assemblers can cost as much as $80, you probably don't need one unless you want to learn Assembly-language programming.

It is possible to hand assemble an Assembly listing, but this is a tedious process that is best left to someone with a little experience with Assembly programming. It also requires a short Basic routine that prepares your CoCo for hand assembly.

We convert some Assembly programs to Basic DATA statements and include a short Basic routine to load and execute the DATA statements. This gives you a program that you can type in just like a Basic listing, yet it operates much like one written in Assembly.

If you want to run one of *HOT CoCo*'s Assembly listings, but it hasn't been converted to DATA statements and you do not own an editor/assembler, check to see if the program is included on our Instant CoCo cassette. All Assembly programs on Instant CoCo are in assembled form, meaning you can load and execute them immediately.

Speaking of DATA Statements

Since DATA statements often consist of numbers only, it is easy to make a mistake typing them in. One wrong number can crash the program or lock up your machine. When this happens, the only way to recover is often to turn off the computer for a few seconds and then turn it back on. Of course, this wipes out your program in memory.

To avoid this, always save what you have typed in before running it. That way, if you did make a mistake, you can load the program from tape or disk to look for the error, rather than retyping the entire listing.

One last thing about DATA statements: Error messages that occur due to a mistyped DATA statement line will refer to the corresponding READ statement line earlier in the program. Yet it is the DATA statement that in incorrect.

If All Else Fails

If you cannot get your typed-in listing to run after checking and double-checking for typos, you can ask us for help. Send a detailed description of your problem along with any error messages given. Ideally we'd like a printout of what you typed. Send a self-addressed, stamped envelope for the fastest reply. Sorry, but we cannot help you if you have modified the orignal program in any way. Write to *HOT CoCo, attn. Technical Editor, 80 Pine St., Peterborough, NH 03458.*

Different ROMS

Radio Shack has updated the Basic ROMs in the Color Computer several times since it was introduced. Below is a list of the ROMs and the problems and benefits you might encounter with each one:

- Color Basic 1.0—Cannot fully use the 64K upgrade and has only a 7-bit serial printer routine, which inhibits sending graphics data to a printer.
- Color Basic 1.1—Fully supports 64K and has an 8-bit serial printer routine for graphics.
- Color Basic 1.2—Executes code faster than previous versions, but changed the way the ROM reads the keyboard. This makes some software written for the older ROMs incompatible with the 1.2 ROM. There is a simple fix, which *HOT CoCo* incorporates into every program in which this problem is encountered.

If you don't know what Color Basic ROM version you have, type EXEC 41175 after you first turn on your computer. The ROM version will be printed on the screen.

- Extended Basic 1.0—Has bugs in the PCLEAR, PRINT USING, and DLOAD statements.
- Extended Basic 1.1—Fixes the abovementioned bugs.
- Disk Basic 1.0—This is in the disk controller cartridge used with the grey CoCos and grey disk drives. The 1.0 Disk ROM is incompatible with CoCo 2's.
- Disk Basic 1.1—Works faster than 1.0, but you can use the 1.1 Disk Basic controller with the older, grey CoCos. Also, many routines have been moved, making some programs written using the 1.0 Disk ROM incompatible with the 1.1 ROM. (See "A Quick Fix for Your Disk ROM," by Mike Meehan, *HOT CoCo*, February 1985, p. 44, for a utility that overcomes this incompatibilty in most cases.)■

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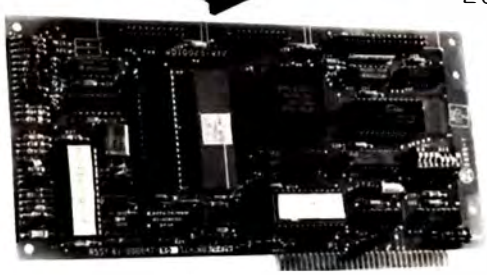

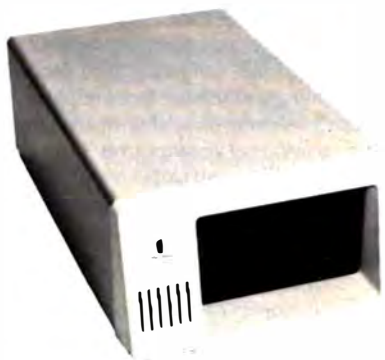

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Letters to the Editor

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Computers Not For Art

I was thoroughly disgusted with the article by Paul Statt, "Portrait of the CoCo Artist" in the February 1985 issue of *HOT CoCo* (p. 28).

I would like to know why drawing is so impossible for Ana Landa without her computer. Doesn't she have access to pencil and paper? The elements that make up a good work are patience and skill. It may not be easy to correct mistakes on paper, but you can sketch lightly first and then darken in. Furthermore, you can't get as much feeling as you really should when you use a computer to draw. Drawing and sketching shouldn't be made easy because they aren't.

Eric White has a few of his facts straight, but covering up mistakes isn't important. It's using mistakes to enhance a picture that makes a drawing more interesting. Picasso, for example, left his mistakes in and it didn't hurt his works. Frankly, it doesn't matter if you make mistakes and let them show.

And a word to Whitesmith, you can already make enlargement, reduction, rotation, or section transfers by hand and do it better than the computer can. You can't add as much detail by computer as you can by hand, so you have more flexibility on paper.

It's also not true that a water color has to come out right the first time. With pen and paper, you can always change your mistakes into new and better pictures; with the computer you erase your mistakes immediately and forget them.

I have nothing against creating pictures on the computer, it's fun. But I don't think the computer should be used for professional art. The rest of the February issue was great and I enjoyed it very much.

Susan Mohr
Cottonwood, MN

Drawing isn't impossible for me without a computer. It's easier; that's important because I have very little free time. You're right, good work does involve both patience and skill.

In my experience, computer-aided drawings take as long as other methods because the computer's inherent flexibility invites you to draw something yet another way. I can get a much better feel for my work than is possible using other art forms. Graphicom's stamps, for example, give me a degree of control over my work that is impossible in other media.

New techniques and media benefit mankind; if artists never tried new media, perhaps we'd still be limited to a few scrawls on cave walls. The computer already has a place in professional art. Look at CAD (Computer-Aided Design/Drawing), for instance. If we were unable to use computers professionally, we'd be taking a large technological step backward at the expense of efficiency. I prefer to let people do the thinking and let computers do the work.

Computer art can be reproduced exactly and even transmitted over phone lines. No other medium allows so many people to enjoy a perfect original or presents such potential for artistic collaboration.

Drawing should be easier so that more people could enjoy it. Thank you for the opportunity to expand on my original comments. I hope you enjoy your hobby as much as I enjoy mine!

Ana Landa

Our program doesn't do anything creative; it's a tool, like charred sticks on a cave wall were at one time. Statements from your letter indicate that you feel art should be left in the hands of those with the right technical skill. If creativity can be expressed in such varied media as music, sculpture, poetry, dance, and painting, then it is creativity that is important, not the technical expertise with which it was rendered, nor the form that it embodies.

The artistic work of school children shows a marked decline during adolescence when they can no longer satisfactorily express themselves with their limited technical skills. Some improve their skills, but most stop trying. Given a creative outlet that requires less skill, they will again experiment with expression.

If you are doing commercial artwork or painting a portrait, you can't afford to make a mistake. Fear of making mistakes may prevent someone for whom drawing is difficult from venturing an untried stroke. The ability to undo mistakes encourages experimentation.

The computer with its limited resolution, texture, and color is nonetheless a perfectly valid medium for creativity. As long as the comptuer doesn't channel or limit our imagination, it will remain so.

Eric White

Back in Orbit

Blast! Although the author's original was fine, a bit-drop error occurred in R. Dewain Poe's program, World Map ("Orbital Observations," HOT CoCo, April 1985, p. 30). Here are the corrected lines:

```
66Ø DRAW"M13Ø,96;M126,96;M122,92
;M122,87;M124,84;M132,84;M134,89
;M134,83;M136,77;M136,73;M144,65
;M146,65;M146,67"
88Ø DRAW"BM3Ø,98;M32,98;M32,1ØØ;
M3Ø,1Ø1;M3Ø,1Ø3;M28,1Ø2;M28,1ØØ;
M3Ø,98":PAINT(3Ø,99),6,6:DRAW"BM
32,1Ø3;M34,1Ø4;M3Ø,1Ø6;BM3Ø,1Ø8;
M34,1Ø6;M34,11Ø;M32,11Ø;M32,1Ø8;
M3Ø,1Ø8"'PHILLIPINE ISLANDS
93Ø DRAW"BM62,153;M66,157;M6Ø,16
5;M56,163;M62,157;M62,153":PAINT
(6Ø,163),6,6 'NEW ZEALAND
1Ø4Ø DRAW"BM184,45;M186,5Ø;M186,
56;M182,56;M182,53;M184,52;M184,
5Ø;M182,47;M184,45;M184,48":PAIN
T(184,55),6,6:DRAW"BM178,54;M178
,5Ø;M18Ø,5Ø;M18Ø,53;M178,54"'BRI
TISH IS.
```

—eds.

And now, a word from the author:

I have received letters and calls on my World Map and Satellite Tracking Programs (*HOT CoCo*, April 1985, p. 31). The system requirements specified Extended Color Basic, but some people are trying to use the programs with Disk Basic. They get an SN error because AS is a reserved field command in Disk Basic. Change the variable AS in lines 260–300 of Satellite Tracking to AZ to solve this problem.

There were two bit-drop errors in the Satellite program listing. In line 760, insert a less-than symbol (<) after CL. In the third 32-character line of line 1430, insert a comma, changing the motion command from M3098 to M30,98.

If North America doesn't show on your map, check the COLOR statement in line 620 of World Map and line 1200 of Satellite Tracking. Also check your PAINT commands.

The World Map program uses colors 6 (cyan) and 7 (magenta) from color set 1. To get blue and green, you must adjust your TV's tint control. I chose these colors instead of colors 1 (green) and 2 (blue) of color set 0 to allow easy modification into a high-resolution black-and-white map by changing PMODE 3 to PMODE 4 in line 30.

If you prefer a black-on-green hi-res map in either program, change the SCREEN commands to SCREEN 1,0 in lines 105 and 250 of World Map and line 380 of Satellite Tracking. To then use the plotting routine in World Map with either hi-res screen, add the following line:

```
265  IF PPOINT (XP,YP) = 0 THEN CIRCLE
     (XP,YP),8,5:GOTO 100
```

Changing the 8 to a 5 reduces the size of the circle drawn, but change the first 8 in line 270, too.

I hope these fixes are helpful to those using the programs.

R. Dewain Poe

MC-10 Graphics Available?

Does anyone have a good graphics program for the MC-10 that uses the control keys, supports all eight colors, offers LOAD and SAVE features, and includes a screen-dump routine? I have a 20K MC-10 with cassette and a CGP-220 printer.

Arne J. Gregor
1606 Lincoln Court
Reading, PA 19605

Tape-to-Disk Instructions

Discovering *HOT CoCo* was a real pleasure. I particularly enjoy the articles and programs that help me to understand computer operations better. Basic programs present no problem for me, but machine-language programs are difficult, especially when they require transferring information from tape to disk. Articles sometimes tell how to do this, but generally I'd appreciate it if all articles did so, or if *HOT CoCo* published some general instructions for this type of transfer.

I have gradually upgraded my system from the original 16K CoCo 2 with a cassette drive to a 64K system with three disk drives and a DMP-110 printer. Like many people, I had trouble finding an acceptable arrangement for my new equipment, that is until I bought a computer table from The Sharper Image, 650 Davis St., San Francisco, CA 94111. Their computer stand #DGR103 ($149) and two shelf risers #DGR104 ($69) offer ample room for all my equiment, including my 9-inch monitor and Multi-Pack Interface, and still leave room for some of my books. I'm sure other subscribers with limited space would find this stand useful.

I've also purchased the complete VIP library of software and many other programs advertised in your magazine. I find them all very useful and educational. Please keep up your good work.

Herbert E. Crumrine
Rochester, NY

Better Track Record

Dennis Elfert's disk-saving program (*HOT CoCo*, March 1984, p. 54) is excellent. Keith Langill modified the program to work on two disks (*HOT CoCo*, July 1984, p. 8). For a simpler modification, reverse the position of the directory disk and object disks. Then delete lines 135 and 140 and change the following line to read:

```
53   INPUT"PUT YOUR D.D. IN DRIVE 0
     AND YOUR OBJECT DISK IN DRIVE
     1";Q$
120  DSKI$ 1,17,X,D$(Y),E$(Y)
365  DSKO$ 1,17,X,D$(Y),E$(Y)
```

Robert W. Freedman
Pittsburgh, PA

Use Auto-Page With ROM Packs

Your article "Don't Print There!" (*HOT CoCo*, March 1985, p. 48) was the answer to my prayers. I have been using the Color File ROM pack to keep track of my inventory and print the entire file. It used to be very frustrating when the printer printed over the perforation. Now, thanks to you, all is well.

Readers might be interested in my fix to get the program to work with a ROM pack. First, holding the pack in front of you with the label facing away and the arrow up, disable the auto-start by placing a small piece of tape over the auto-start pin (the first one from the left). When the pack is in the computer, the screen shows the normal introductory logo, as if there were no ROM pack in the slot. To start the pack, type EXEC 49152. To revert to Basic, press the reset button. You can go back and forth as often as you like.

To use Auto-Page with the ROM pack, insert the pack and turn on the computer. CLOADM and EXEC Auto-Page; then EXEC 49152 and you are in Color File.

If, after you complete the listing, you wish to print another list, just press the reset button to get back to Basic, reposition the paper, POKE 32760,0 to reset the counter, and EXEC 49152 to put you back in the ROM program.

The disabling technique works for other ROM packs, too. I have used it with Videotex to save the buffer to tape.

Robert E. Niesyn
Cromwell, CT

Negative-Image Dumps

In the February 1985 issue, *HOT CoCo* featured an article, "Do it Yourself Dumps," (p. 40), dealing with a screen-dump utility. R. Steven Berry's program works well, but it doesn't allow my Radio Shack DMP-105 printer to produce a negative image. To switch to a negative image on the DMP-105, insert these four lines:

```
54   FOR X = &H3FB6 TO &H3FBE
55   READ A:POKE X,A
56   NEXT X
260  DATA 182,62,171,67,138,128,
     126,62,65
```

Change line 140 to:

```
140  DATA 38,239,126,63,182,18,
     132,213,133,64
```

Lines 54–56 are a new routine to do an LDA STORE, COMA, and ORA $80 and then return to the main loop at $3E41. Line 260 is the data for the routine at $3FB6. The change in 140 routes the processor to 3FB6 and also moves the COMA to the routine at 3FB6 (put in an NOP where the COMA used to be).

Since I moved the COMA from &H3E41 to &H3FB9, you have to POKE &H3FB9 with 18 to get a negative image. To return to regular mode, POKE &H3FB9 with 67.

I hope this modification helps other readers. By the way, I just love the new DMP-105. Many people I know who bought more expensive printers are surprised at the number of features it has.

Neal Park
Phoenix, AZ

Statistical Programs for 64K

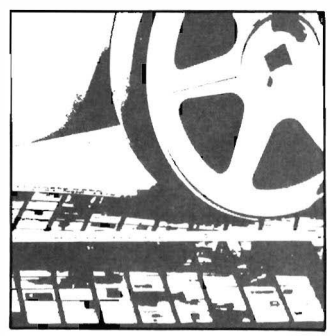
Stephen Hicks asked about statistical-analysis programs for a 64K machine (*HOT CoCo*, October 1984, p. 11). I wasn't sure I could help, but I sent him references to three programs written in Basic. To my surprise, he wrote back to say he'd received nine other replies, all asking if he'd found anything, and suggested I write to you.

Enclosed are the references I have. I'd appreciate hearing about similar program collections (regardless of the language).

Kanter, Harold, *Computer Applications of Educational Measurement Concepts*. New York: Macmillan, 1985. (oriented toward correlational analysis)

Van Tassel, Dennie, *Basic-Pack Statistics Programs for Small Computers*. Englewood Cliffs, NJ: Prentice-Hall, 1981. (the most di-

This Publication is available in Microform.



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Ann Arbor, Mi. 48106

verse of the three and the most expensive)

Wolach, Allen H., *Basic Analysis of Variance Programs for Microcomputers*. Monterey, CA: Brooks/Cole, 1983.

Mike Wogan
Dept. of Psychology
Rutgers University
Camden, NJ 08102

Where's the Software?

I am a CoCo user from Toronto, Canada. I enjoy programming and using my CoCo but can't seem to find any places in Toronto carrying software for it. I wonder if readers know of a distributor in Toronto. I am also looking for a Canadian distributor of Instant CoCo because, if I order it from the U.S., it takes ages to get through customs.

Rob Kraft
22 Robingrove Rd.
Willowdale, Ontario
M2R 2Z7, Canada

Plea for MC-10 Users

Including the minimum RAM requirements for listings in articles is great, but it doesn't go far enough. A requirement of 32K eliminates a 16K unit, but 20K, a common arrangement for the MC-10, might be sufficient. In addition, readers might pare a listing, eliminating remarks or sections that aren't essential to them. It is easier for the programmer to take a count than it is for the readers. A notation of the actual byte requirement for each program as written, stated in the opening program line, would be helpful.

Don't ignore us MC-10 users. We still support you and would like to be supported in return.

Roger Koach
Apple Valley, CA

We try to convert every Color Basic program we publish to the MC-10, and all programs that are MC-10 compatible are listed as such in the System Requirements boxes. Your suggestion to include the minimal requirements in remark statements is a good one. We urge anyone writing programs for HOT CoCo *to keep this in mind.—eds.*

TRSCOPY Bug

There is a minor omission in the otherwise excellent new TRSCOPY routine from Radio Shack. Basic-09 won't load a transferred ASCII Disk Basic program. Apparently, TRSCOPY doesn't assign the proper OS-9 file-header language value in the conversion. This value is included in the file header to prevent crashing the system if you load a wrong module.

However, most security measures can be defeated with a little experimentation. The key is to fool OS-9 and Basic-09 by either modifying the file-header language value or by imbedding the offending file in another file with the proper characteristics. You can do this with an Assembly-language routine, but it's simpler to create a one-line Basic-09 program file with just a REM statement and save it. Next, use OS-9's merge utility to combine the first two files (the legitimate file must be listed first). You can then load the new, merged file. This method seems to work because OS-9 checks the header data only once when you use Basic-09.

I hope Tandy notices this and issues a new version that handles Disk Extended Color Basic to Basic-09 conversion more readily. Files of type /BAS should receive the proper header language value when converted to OS-9.

Fred Niemczenia
Fort Meyers, FL

SUPPORT

(sə·pôrt) v.t. **1**. To bear the weight of, especially from underneath; uphold in position; keep from failing, etc. **2**. To bear or sustain (weight; etc.) **3**. To keep from failing; strengthen: *PBJ, Inc. supports their product line with technical personnel that are always there to help you.* **4**. To serve, to uphold or corroborate (a statement, theory, etc.) substantiate; verify: *PBJ, Inc. receives testimonials on a daily basis that support their product line.* **5.** To provide (a person, institution) with maintenance; provide for: *PBJ, Inc. supports the CoCo user by consistently creating new advancements in their field.*

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Blackjack Dealer
Feeler Dealer

These two programs help you develop your Blackjack skill and strategy. In **Blackjack Dealer**, the computer deals the cards and plays the dealer's hand against you. **Feeler Dealer** enables you to test your strategy by playing the desired number of hands using your techniques & tendencies. A great teacher for new Blackjack players and a valuable tool for the veteran player. Both programs included. 32K extended. Tape - $24.95. Disk or Amdek - $29.95.

EAGLE

A graphic-enhanced lunar lander simulator. The pilot breaks out of lunar orbit and attempts a safe landing on the lunar surface. Joysticks control thrust and craft altitudes and information is continually displayed on horizontal and vertical velocities, acceleration values, vertical and horizontal distances from target, fuel consumption and much more. On advanced levels, problems such as fuel leaks and computer screen failures can provide hair-raising final approaches. Disk version allows choice of landing site between Mars and Earth's moon. Takeoffs from the surface can be made and the upper stage placed back in orbit. The simulation is as educational as it is fun and exciting. Superb graphics! A great tool for that future astronaut or physicist. 32K, 2 joysticks required. Tape - $24.95. Disk or Amdek - $29.95.

Sketchpad

Sketchpad is a graphics drawing program designed to provide the computer hobbyist with easy manipulation of the powerful graphics capabilities of the Coco. Advanced programmers can design graphics screens and characters for Basic and ML programs and games. Sketchpad was used to create the graphics for "Eagle."

Two joysticks control cursors that provide end-points and boundaries for lines, boxes, circles, ellipses and painting. Point-to-point drawstrings may be plotted on the screen and then rotated, enlarged or shrunk, moved or inverted. Patterns may be programmed in easily to creat dazzling illusions using lines, boxes, circles, ellipses and drawstrings. Sketchpad supports all PMODES and color sets and gives false colors in Pmodes 1 and 4. Text and graphics can be combined on high-resolution screens. All pictures and drawstrings can be saved to disk for future use. 32K, 2 joysticks required. Disk only. $29.95.

TESTMAKER

Menu-driven series that creates mult choice & T/F tests. Output to screen or printer. 32K Disk. $29.95.

Maycode

A 6809 Disassembler. Maycode will read the machine code from memory and convert it to standard 6809 Assembly Language Mnemonics. Output can be sent to screen, printer, cassette, or diskette. The output to cassette or diskette may be reloaded into EDTASM+ for modification or re-assembly. 16K min. Tape - $24.95. Disk - $29.95.

TDIR

TDIR is a menu-driven, user-friendly tape directory program. When installed and maintained on your cassette tapes, it allows complete directory control of your tapes. This means you will no longer need to go through a complete tape to discover that the program you wanted is on another tape. TDIR also eliminates the drudgery of trying to remember tape position settings, or program names. All this, and more, is controlled by TDIR. 16K tape. $24.95.

Alphacopy

It is nice to have an alphabetized disk directory, but if that should crash, it doesn't help tell you where the programs are. Alphacopy will fully alphabetize your disk; that is, write the programs in alphabetical order. Each program will be written on the same or consecutive sectors, thus making rebuilding of the disk much easier with the other currently available disk "zapping" utilities. ALPHACOPY will also allow you to format disks up to 80 tracks if your drive allows, thus giving you more space to store programs per disk. 32K Disk or Amdek - $24.95.

Co-Co Receivables

Keep track of all those accounts with current list of accounts, statement printing, last activity date, and current month's transactions, debits & credits. Disk storage of data. 32K Disk. $29.95.

Stars Of America

Education should be fun - this program is just that! This tutorial uses 25 of the superstars of American history from George Washington to Ronald Reagan.

The Civil War

A challenging two - person game. Questions cover Carpet Baggers to the Battle of Vicksburg. Points are assigned according to the difficulty of the question, scores are displayed throughout the game.

Both Only: Tape 19.95. Disk 24.95

History From 1607 To 1976

On two 16K non-extended tapes. For 1-4 people. Informative & fun way to learn important dates in world history. Written for students by a teacher. Tape - $19.95. Disk or Amdek - $24.95.

TREASURE HUNT

A graphics text adventure. You walk with our graphics character through desert, mountains and city to seek the illusive treasure of gold. Super graphics with a person who walks with you at each turn. 64K Disk & Amdek only - $29.95.

Loveless Manor

Trapped in a bedroom by your evil aunt, you've admired Queen Cinderella's castle in the distance and you've just discovered she's a distant cousin. Can you escape to her protection? 32K Great word adventure. Tape - $19.95. Disk or Amdek - $24.95.

Raid On Burdanovka

Your mission, should you decide to accept it, is to steal Russia's newest weapon and save the world. Text adventure with 50 rooms. Tape - $24.95. Disk or Amdek - $29.95.

Search For The Llangth

After years of study & searching, you have at last traced the alien race of Llangth to this valley. Now your quest for the power of Llangth begins! Tape - $24.95. Disk or Amdek - $29.95.

Also Available For TRS-80• Model 100

OTHXO

Othello™ machine language game for the 16K Ext CoCo. 2 modes of play - you against a friend or you against the computer. When playing the computer, it will play hard or easy. Object of the game is to change the opponent's spots to yours by placing your marker at the end of a row started by your marker. Not as easy as it sounds! Tape, $24.95. Disk or Amdek, $29.95.

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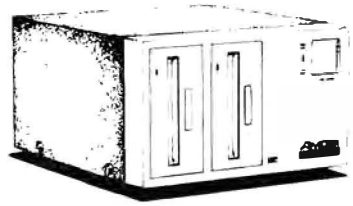

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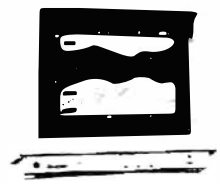

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AUTHORS! ASK ABOUT OUR ROYALTY PROGRAM

More Protection

I'd like to offer an alternative to Mr. Hill's method of protecting unauthorized use of your disk files (*HOT CoCo*, April 1985, p. 13). Simply use this formula: SAVE"file name" + CHR$(143). The directory then shows the name of the file, so anyone trying to load it would type in the name listed, but the CoCo would return an NE error because it doesn't see CHR$(143). You can get into the file by typing LOAD "file name" + CHR$(143). To kill a protected a file, type KILL"file name" + CHR$(143) + "/BAS".

Barry Hornstein
E. Rockaway, NY

Home Improvement

Mr. Rose's Homespread program is great. But I added a HOME command to eliminate tapping the arrow key to get the cursor to A1. I also added an exponential function to allow formulas with square roots and exponents.

Change the program to read:

```
6ØØ PRINT@488,"COMMAND:B,C,I,P,S
,T,H?"
651 IF SC$="H"THEN8ØØØ
2841 IF MID$(FT$(W),4,1)="^"THEN
 RE=VAL(OP$(1))^VAL(OP$(2))
2891 IF MID$(FT$(W),8,1)="^" THE
N RE=RE^VAL(OP$(3))
8ØØØ PRINT@448,"HOME":FOR D=1 TO
5ØØ:NEXT:POKE1Ø23+L,143:L=34:HP=
1:VP=1:RL=1:Y=1:GOSUB18ØØ:GOSUB9
55:GOTO12Ø
```

Then you can execute HOME and have the cursor move to A1 by typing /H. To find a square root, raise the number to a power of 0.5.

I'd like to exchange information with anyone interested in computers.

Petri Pellinen
Rajavartiosto 32A 2
SF-55910 Imatra 91
Finland

Accurate Timing

Your answer to a reader's letter on disk-drive timing programs (*HOT CoCo*, April 1985, p. 13) misses the point completely. When you calibrate the speed of a drive, its long-term stability is not dependent on your accuracy but on the quality of the mechanical and electrical components in the drive. You calibrate a drive to make it compatible with someone else's disk so that you can exchange disks. Therefore, you must use a common time standard against which you measure the calibration.

Even if your program is accurate (no small matter), your CoCo's master oscillator may not be. You need a high-quality frequency counter that has already been calibrated against a laboratory standard to first calibrate the oscillator. It would be better to use the frequency counter to calibrate the drive in the first place.

In any case, the tolerance variance in the index-hole location on different disk results in such a deviation in measured speed that you need a certified reference disk to do a drive calibration.

Robert Gault
Grosse Pointe Woods, MI

Clubhouse

Have a Color Computer club? Let prospective members know about it through a letter to the Editor.

N.E. CoConuts Correction

We would like to point out an error made in "*HOT CoCo*'s Worldwide User's Group List," (*HOT CoCo*, February 1985, p. 49). The information listed in the table is out of date. Our permanent address is:

New England CoConuts
P.O. Box 6604
Providence, RI 02940-6604

As club secretary, I am the contact person and can be reached at 401-739-8743. We ask that all inquiries include a stamped, self-addressed envelope. No collect calls, please.

Robert J. Sullivan, Jr.
Providence, RI

Fort Worth, TX

The Fort Worth CoCo User Group meets the fourth Tuesday of each month from 6:30–8:45 p.m. in Classroom B at the Downtown Public Library at 300 Taylor St. For more information, call Lloyd Rogers (294-9904). Barry Pottinger (297-2732), or Harley Ainsworth (834-9030).

Lloyd Rogers
Fort Worth, TX

Toledo, OH

The Greater Toldeo Color Computer Club has just celebrated its second anniversary. The club meets the first Thursday of each month at the Wernert Civic Association Bldg., 5060 Douglas Road, Toledo, OH. They operate a members-only BBS and are offering a machine-language class. Contact Bob Butler at 537-1432.

Ronald L. Hall
Monclova, OH

Mercer County, NJ

CoCo users interested in joining The Mercer County Color Computer Club should call 609-883-0823.

A.T. Most
Lawrenceville, NJ

Kingston, Ontario

The newly formed Kingston CoCo Club meets the first Monday of every month at Kingston City Hall. If you would like more information contact me at 613-389-0467 or Ken, our president, at 613-544-2806.

Kanti Dinda
Kingston, Ontario

On Line

Are you operating a BBS? Send us a note to let our readers know about your service.

Important Correction: Wrong Number

"HOT CoCo's BBS Phone Book" (April 1985, p. 48) contained three incorrect phone numbers. The numbers for the Samoht BBS in Reston, VA, the Careers BBS in Dallas, TX, and Colorama of El Paso, TX, are incorrect. Please do not call these numbers.—eds.

Sunnyvale, CA

The Computer Literacy Bookshop Network offers customers access to its catalog during off hours (Monday through Friday from 8:30 p.m. to 9 next a.m., and Saturday and Sunday 6:30 p.m. to 9:30 next a.m.). To access the network, dial 408-730-9959, press two carriage returns, type the word "books," and type "R Conference" to view the main topics. Once you are logged on, type "Read Help Complete" for further instructions.

Computer Literacy Bookshop
520 Lawrence Expressway
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Sunnyvale, CA 94086

NY, NY Update

Our BBS, Grand Central Terminal, now supports both 300- and 1,200-baud users. As always, we are up 24 hours a day, 7 days a week at 212-682-0681. Our thanks to *HOT CoCo* readers for their contributions, uploads, and support.

Steve Schechter
New York, NY

Tampa Bay Area, FL

Compunet BBS of St. Petersburg, FL, is open to all callers, 24 hours a day, 7 days a week. It features downloading, uploading, text files, trivia, worldwide news and weather, and more. You can reach the board (300/1,200 baud) at 813-321-0397.

Emery Mandel
St. Petersburg, FL

Telewriter-64™

the Color Computer Word Processor

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- **Drives any printer**
- **Embedded format and control codes**
- **Runs in 16K, 32K, or 64K**
- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...
— Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

...truly a state of the art word processor... outstanding in every respect.
— The RAINBOW, Jan. 1982

PROFESSIONAL WORD PROCESSING

You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

To order, send check or money order to:

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Del Mar, CA 92014

Or check your local software store. If you have questions, or would like to order by Visa or Mastercard, call us at (619) 755-1258 (weekdays, 8AM-4PM PST). Dealer inquiries invited.

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Doctor ASCII

by Richard E. Esposito and Jesse W. Jackson

Having technical difficulties? Consult the Doctor for an answer. Due to the volume of mail Doctor ASCII receives, we cannot guarantee that your query will be published. Please send a self-addressed, stamped envelope with all letters to Doctor ASCII, c/o HOT CoCo, *80 Pine St., Peterborough, NH 03458.*

Q. Occasionally, after turning on my 16K CoCo 2 from a cold start, the computer freezes after a minute or two and the screen fills with garbage. The only way I can regain control is to reset the computer or turn it off and back on again. How can I remedy this frustrating situation?—*Wayne Hubert, Duluth, MN*

A. Sounds like a bad connection. Check that your memory chips are firmly seated and that there are no bent pins. Also, disconnect any peripherals you have attached and try to isolate the problem by plugging them back in one at a time.

Q. I want to add a pilot light to my 64K CoCo 2 (a red LED with a 470-ohm resistor). Where do I safely tap into the 5-volt supply? Also, I sometimes lose control of my computer, whether it is hot or cold. The keyboard does not respond and the reset button does not work. Garbage appears in two vertical columns under the PRINT @ locations 1 and 10. What's the problem?—*Paul Hache, Amos, PQ*

A. Looking from the front of the CoCo 2, the 5-volt is in the upper left corner. Locate resistor R2, a ½-watt, 0.1-ohm, series-current limiter color-coded brown, black, silver, and gold. The right side of R2 is a good place to pick off power for your pilot light. C5 is cut out on my CoCo 2, and its right terminal on top of the board is connected to +5 volts; you could solder to this. C5's left terminal is ground.

The most likely suspects of your hangup problem are memory and the SAM chip. Try running a memory-test program. Several diagnostics routines, including a memory test, are provided on Radio Shack's Diagnostic ROM program pack (catalog no. 26-3019), which sells for $10.95.

Q. What type board is in my CoCo 2? How do I get a technical reference manual for it? Can I interface an RGB color board to the CoCo 2 for better resolution? Can you inform me about software suppliers in Europe?—*P.T.J.G. Lammers, Hetthuysen, Netherlands*

A. The CoCo 2 has appeared in three flavors: the original (made in U.S.A.) and two Korean-built versions. Both the original and the first Korean-made versions are similar, and you can upgrade them to 64K using eight 4164 dynamic RAM chips. The latest Korean version uses only two memory chips instead of eight. You could upgrade it using some kind of piggyback board containing 4164s. Radio Shack has not yet made this piggyback, but is replacing the board with the eight-chip version for the upgrade. (Ed. note: See "64K Modification Revisited" elsewhere in this issue for more CoCo 2 upgrade information.) The D, E, and F (or 285) boards apply only to the original, grey CoCos. Radio Shack has changed the CoCo 2's model number with each board change. (See the table below.)

16K Standard Basic	16K Extended Basic	64K Extended Basic	
26-3026	26-3027	26-3127	Original
26-3134	26-3136		1.2
26-3134A	26-3136A		1.2.3

1. Made in Korea
2. New keyboard design.
3. Uses two TMS4416 16K by 4 RAMs instead of eight 16K by 1's. New SAM chip with 256-cycle refresh instead of the previous 128-cycle version.

Color Basic 1.3 (Extended Basic version uses one 16K ROM instead of the previous version's two 8K ROMs.)

To order a technical manual for any Radio Shack product, just prefix that product's catalog number with TM—e.g., TM 26-3003.

RGB monitors are generally more expensive, and the low resolution of the CoCo's 6847 VDG (video-display generator) doesn't justify the extra cost. A TV set is adequate except in cases where rfi (radio-frequency interference) is a problem.

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Q. I have never been able to get my C. Itoh 1550B dot-matrix printer to work with my Color Computer. I've been told that my problem is getting the correct hookup between the printer's serial port and the CoCo's. Can you tell me how to do this? I have a Radio Shack cable that is supposed to work, but it doesn't.—*Brent Prokopishin, Saskatoon, Saskatchewan*

A. You have two problems: your cable and your switch settings. The cable you have (catalog no. 26-3014) is for connecting the CoCo to a modem, and the wiring is incorrect for your printer. Also, your printer must have either the RE or RD type of serial interface; the CD interface is a current loop and will not work without a converter between the printer and the CoCo. I've compared the cable you have with the cable you need below.

The cable you have:

CoCo (DIN plug)				RS #26-3014 (DB25S)
Signal	*Pin #*		*Pin #*	*Signal*
CD	1	> . . . . . <	8	DSR
IN	2	> . . . . . <	3	RX Data
GND	3	> . . . . . <	7	Signal Ground
OUT	4	> . . . . . <	2	TX Data

The cable you need:

CoCo (DIN plug)				C. Itoh (DB25S)
Signal	*Pin #*		*Pin #*	*Signal*
CD	1	> . . . . . <	20	DTR
IN	2	> . . . . . <	2	SD
GND	3	> . . . . . <	7	Signal Ground
OUT	4	> . . . . . <	3	RD

You could modify your cable for the proper connections, or if you are handy you can make your own in one of two ways. First you could buy a DIN to DIN cable, remove one end, and wire it to a DB25P

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PC Magazine†:

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"At $795, the D-300 can't be beat."—John Dickinson

Creative Computing:

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"I find the correspondence print of the D-300 to be the best in its price range."

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*From a review of the following printers: Epson FX10, Okidata Microline 83A, Panasonic KX-P1091, Star Micronics Delta-15. †From a review of 31 printers tested, selling for under $800

connector. Second, you could make the whole cable from scratch. buying a DIN plug and DB25P connector, and using your own wire. (I recommend #22 guage stranded.) Here are the part numbers for these:

- RS #26-2014, $19.95, four-pin DIN to DB25 modem cable
- RS #26-3020, $4.95, four-pin DIN to four-pin DIN printer cable
- RS #274-007, $1.49, four-pin DIN plug
- RS #274-1547, $2.99, DB25P connector
- RS #274-1549, $1.99, hood for DB25P (optional)

The switch setting indicates that when you turn on your system, the printer is deselected and will not print until it receives an XON character. The printer then prints until it receives an XOFF character. This is known as XON/XOFF protocol. Below is a listing of the switches. An asterisk indicates that the switch should be changed to that position for the CoCo. A plus sign indicates that this setting is standard as set at the factory. A question mark indicates a recommended change (e.g., slashed zeros are easier to spot when debugging) or that it wasn't clear from the manual, so experiment after you get the printer working. If there isn't an asterisk or question mark, use the standard setting.

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Q. When I use a 4-foot flat cable with my disk-drive interface, everything works fine. But when I use the cable with the Radio Shack Multi-Pak Interface, the keyboard crashes and garbage appears on the screen. Why?—*William Link, Richfield, NC*

A. Not many people have been successful in extending the Multi-Pak via ribbon cable. This method decreases noise immunity and reduces the bus's bandwidth. The E and Q clocks are distorted by capacitors C27 and C28. Also, an additional delay occurs because the data bus is enabled via the PAL chip.

Switch	Open	Closed	Function
1-5	ON +	OFF*	Processing of DC1/DC3 (XON/XOFF) signal
1-6	ON +	OFF?	Line feed when the buffer is full
1-7	CR +	ALL?	Print command (CR, LF, VT, FF, US)
1-8	OFF +	ON*	Line feed after carriage return (CR)
2-1	OFF +	ON?	Print slashed zero
2-2	N +	1	Selection of buffer selection lines
2-3	66 +	72	Top-of-form (TOF) to TOF line length
2-4	1/6 +	1/8	Power-on line-feed pitch in inches
2-5	10 +	Prop	Power-on character pitch (10 cpi/ proportional)
2-6	8 +	7	Selection of 7- or 8-bit data
2-7	DE +	SEL*	Selection of power-on deselect/select
2-8	OFF +	ON	Power-on unidirectional printing

Q. I bought a game that automatically executes after I LOADM it. How is this done? Can I fix a program to do this without disassembly or patching?—*Warren Barnes, San Jose, CA*

A. One way is to put a loader program into the area that Basic uses for the get-next-character routine. Basic doesn't use this area while loading a file, and when loading is finished, Basic will encounter the loading program when it tries to get the next input.

Listing 1, PUTLDR, is a Basic program that will put such a loader in a machine-language disk file. It does not copy the file; it actually modifies it on the disk, so have a backup of the disk before you try it. PUTLDR is a utility that gets the load, end, and transfer addresses of a program and adds or removes the auto-loader from the file. ■

See program listing on page 46

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Mindbusters

by Richard Ramella

The Fifteen Puzzle

The sliding-tile puzzle is a wondrous little gadget whose prime purpose it seems is to keep children occupied on long car trips. It consists of a tray of interlocked tiles with one open square. The object is to reorder the tiles based on one of several themes. Some versions require that you order numbers, others have you arrange part of the alphabet, and still others ask you to correctly spell words or put the elements of a picture in order.

Another from Sam Loyd

Sliding-tile puzzles derive from the Fifteen Puzzle, an invention of master puzzle maker Sam Loyd. The Fifteen Puzzle is a four-by-four box containing 15 numbered tiles (numbered one to 15) and an empty space. In the 19th century, Loyd offered a $1,000 prize to anyone who could complete a Fifteen Puzzle that began with the numbers ordered correctly except for the last two (14 and 15), which were reversed. The tiles of the Fifteen Puzzle can be arranged in nearly 21 trillion combinations, and exactly half of them are insolvable. The wily Loyd had figured out an impossible arrangement—his money was safe.

The public paid no attention to mathematicians who published proof that trying to solve that particular arrangement was futile. There were tournaments, newspaper articles, and disappointments. Millions of the puzzles were distributed. Numerous people claimed to have solved the puzzle, but none could remember the moves when tested.

There is a simple rule for determining whether it is possible to solve a given presentation of the Fifteen Puzzle. Start with the first number of the puzzle. Read the puzzle to its end, determining how many lower numbers follow it. Keep a separate running total to which you add a one for every lower number that follows. When you have compared the first number to all the numbers that follow it and added a one to a running total for each lower number, repeat the procedure for the second puzzle number, and so on. If the final total is an odd number, that presentation of the Fifteen Puzzle can't be solved. To make it solvable, exchange any two puzzle numbers.

All the presentations of the Fifteen Puzzle generated by Listing 1 are solvable. To play, type RUN and press the enter key. You slide numbers into the blank space by pressing A for north, Z for south, comma (,) for west, and period (.) for east. Because you can only move into the blank space with one of four numbers, you use the direction key to choose the number or "tile" you want to move. Randomly generated tones sound when you have properly reordered the numbers.

The Bull's Eye

Listing 2 is called Bull's Eye and goes directly to the heart of the mathematical implications of this kind of game. Its object, to correctly rearrange the picture of the bull's eye, is evident at once, but its solution is evasive.

Start the puzzle by typing RUN and pressing the enter key. (If your computer does not accept the speed POKE 65495,0, delete the command from line 110.) The program presents a three-by-four square arrangement on a field of white with only one empty square. On the left is a large orange circle. In its center is a blue square. On the right is a square containing a small orange box. The object is to insert this last square inside the large circle to form the bull's eye. Press A for north, Z for south, comma for west, and period for east. As with the Fifteen Puzzle, the compass direction you select also indicates the square you have chosen to move into the empty box.

Bull's Eye can be solved in 23 moves. Look for the answer in next month's column. Randomly generated tones, which stop when you press the break key, sound when you have completed the puzzle. To see your score, type PRINT LEN(S$) and press the enter key. To see the string of all your moves by compass direction, type PRINT S$ and press the enter key.

Puzzle Contest II

The puzzle in Listing 3 is called Consarnation. It runs on the MC-10 and the CoCo in Color Basic. MC-10 users, see the change in line 130. To play, type RUN and press the enter key. The program draws a large blue frame that contains an arrangement of blue squares. Filling out the frame around the squares are single-digit numbers in no particular order. In the northwest corner is a flashing orange cursor. You move it within the frame by pressing A for north, Z for south, comma for west, and period for east. Trying to move into any blue area has no effect.

The object of the puzzle is to move the cursor around the grid in attempt to land on the highest digit possible with every fifth move. The numbers you land on with every fifth move are totaled by the computer as your score. Digits you land on with a fifth move become zeros when you leave them. You are not allowed to double back on a move within a turn.

At the end of 10 turns, the computer displays your final score and answer string. The latter indicates each of your moves by compass direction. To print out the answer string for your high score, type PRINT #-2,S$ and press the enter key. MC-10 users, type LPRINT S$ and press the enter key. A good strategy is to plan out your moves in advance in order to score the highest number with each turn. The higher your total score, the better your chances of winning the contest. ■

Eds. note—To enter Puzzle Contest II, type or print your name, address, highest score, and its answer string on a piece of paper. Mail it to Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926. Be sure to write your score on the outside of the envelope. To be considered, entries must be postmarked by June 30, 1985. The winner wil be the entrant who submits the answer string with the highest score. In case of a tie, the winner will be determined in a fair and random manner. The winner will receive a free, one-year subscription to HOT CoCo *and the winner's name and score will appear in a future issue.*

See program listing on page 47

System Requirements

16K RAM
Extended Color Basic

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John Hancock

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The Computer Room

by Scott L. Norman

True Life Adventures

Welcome to The Computer Room. When *HOT CoCo* approached me about doing this column, the editors said they wanted a series that would discuss ways of applying the Color Computer in the home, small business, or other organization. Since that's one of my favorite computing themes, I didn't need much recruiting.

While I'm sympathetic to the needs of the newer user, I'll include enough material on applications of commercial products to appeal to a broader audience. This won't be a hard-core programming column, but I do plan to discuss modifications or additions to existing programs from time to time. I may even slip in a couple of my favorite auxiliary routines for you to incorporate into your own material.

And finally, I hope my discussions of how other CoCo owners have used their machines to solve real problems will encourage readers to do some experimenting on their own.

Keeping Track of Stuff

Things rarely turn out as we expect. Once, I thought I'd use my ColorComputer primarily for data management: organizing facts and figures, and keeping them on file for instant recall. It didn't quite happen that way. One reason was that I found a lot of other things to do with my machine, and another was the unsatisfactory state of early data-handling software. In those days I had to write my own Color Basic programs for a tape system, for Pete's sake.

Commercial software is far better now. Nevertheless, I still find that I don't use data-management programs nearly as often as I once expected. Not that I lack for possible applications; I have more material than ever to organize. It's just that most database managers (the generic term, although few CoCo programs live up to its technical definition) are designed to handle information that's neatly organized. Many are unsatisfactory for quick-and-dirty inquiries into disorganized piles of data—what I call the electronic notebook or "Now what did I do with *that*?" jobs. That's unfortunate, because I carry around a lot of mental data-management baggage of that variety. I could use some help.

I do a lot of writing, so I keep a formal database of manuscript status: When did I submit each piece and to whom, when was it accepted, what's the status of the galley proofs, when and how much was I paid, and so on. This is a natural application for a personal computer, and I use it as a test case for database managers. It provides a good excuse for a prolonged trial of a different program every year.

It's easy to break the data for each manuscript (or *record* in database jargon) into a series of well-defined items, or *fields*. This is the kind of organization most commercial programs like to see, and most of them do a competent job of managing it. Some are much more convenient in everyday use than others, however. That's important to me. My manuscript file gets a lot of use, and after a while a program's rough spots will come to my attention like a toothache.

A recent romp through my databases reminded me of some of the high and low points of this class of software. It also refocused my attention on the problem of handling unstructured information; I happened to be in the market for a new "casual" data manager at the same time.

I'd like to share some of my findings with you. Please remember that I can only describe what I myself look for in a data manager. I am not usually interested in squeezing that largest possible file into my system, for example; I simply don't use my CoCo for very large databases. What I *do* care about includes ease of retrieving a specified record from a file, and the ability of a program to produce useful reports.

I must also be very selective. Although a reviewer tends to build up a large software library after a while, it's impossible to use everything all the time. I concentrated on just three candidates for my manuscript-tracking chore, and another for my less-structured data. This means that several very decent programs didn't even make the finals; don't take it to heart if your favorite doesn't appear here.

I have reviewed all but one of the following programs at length in previous issues of this magazine, so I feel few qualms about skipping over the nuts and bolts in order to get to the details.

Pro-Color-File

A class act. Derringer Software's Pro-Color-File (PCF) does a fine job of performing calculations on your data in order to fill out some of the fields in a record. It is also particularly competent at producing complex reports—especially when teamed with its companion routine, Pro-Color-Forms. You should be careful when defining the structure of a PCF file (i.e., the lengths of fields and the types of data they will contain), because once you have begun to enter data, your options for changing a file's setup are very limited. This is true of most CoCo data managers, by the way.

It takes about 50 seconds, plus your own reaction time, to go from startup to PCF's main menu. Human responses come into the picture because the program cannot be set to automatically load a frequently used data file; you must always type the name of the file you want to work with, and you must press the enter key a couple of times to indicate that the correct disk is in the drive.

This isn't much of a price to pay if you use PCF for prolonged sessions, but it can be annoying if you must whip in and out of your data file quickly. As it happens, my manuscript tracking demands this sort of response; I often want to just take a quick peek at the status of one particular piece. For that reason, I hope to have an auto-start modification to report to you in the near future.

In most other respects, PCF does a fine job for me. It is especially good at finding a record on the basis of fragmentary information, since it searches *all* data fields for a target string—the collection of characters you specify. That means I can search for a particular manuscript title, or look at everything I have written for a particular magazine, and so on—a very welcome feature.

Flexi Filer

This provides a nice counterpoint to PCF. Flexi Filer, by Computerware, offers limited math and searching capabilities but does let you build a convenient self-starting system. You can engage an auto-start option to look for a particular data file whenever you begin the program; it takes only about 25 seconds to get the program and a 50-record file loaded into memory, ready to go to work.

Flexi Filer can only search the first field of each record for a target string. To retrieve a specific record for updating, you must know its location number in the file, and it takes

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an extra step to find this. There are a good many selection commands for pulling records out of the file, however; it's easy for me to build a separate file consisting of, say, just the reviews I wrote for *HOT CoCo* in 1984. You can specify as many as a staggering 36-selection criteria at once, linked with AND and OR functions.

The program's mathematical abilities are limited to finding the totals of selected columns when you print a report—not much when compared to PCF, but adequate for many needs. By the way, both of these programs make it easy to specify the video screen instead of the printer as the output device, so you can get a quick preview of a report. It is also simple to get a printout of all the information for any single record, without having to define a separate report format.

Elite-File

A program of surprising flexibility, a few very appealing features, and one or two complexities. Elite-File can deal with files up to 4,000 records in size, although the product of record length and number must always be less than the capacity of a formatted disk—roughly 156K. The program is also able to handle as many as 16 files at once, so you can command it to look through a lot of data when you're hunting for something.

Nice features include the ability to copy a file definition (i.e., the names and lengths of the various fields) from one file to another. I can use that: The easy way to set a year's manuscript file is to copy the definition used for the previous year and start filling in the data.

There a couple of ways to search for a record buried somewhere in a file. You can look for a target string imbedded in any field, or you can specify that the first field of a record be an exact match to your specification. This is usually the faster way to go. Unfortunately, there is no quick-and-dirty way to get a complete printout of a single record when you find it.

In fact, report generation is handled differently from the way it is done under PCF or Flexi Filer. Elite-File does not have a built-in facility for setting up and storing multiple report formats. You must use either its stablemate word processor, Elite-Word, another text processor, or a Basic program to build a "command file" containing the special instructions needed to specify a report's appearance. It is possible to build a report specification at the moment you need it, using nothing but Elite-File itself, but it will not be saved for future use. That gets awkward, unless your reporting needs are awfully simple. It's a pity, too, because Elite-File has enough other bells and whistles to merit serious attention.

CoCo Cookbook

This product caters to the "electronic scratchpad" market. It requires you to learn almost nothing about database technology, since the records are not officially divided into fields. You just enter information about a given topic as a chunk of text; you can easily edit a file and retrieve records, but more complicated sorting and report-generation procedures are out. I tend to use this kind of program as a loosely organized reminder of my progress on various personal and business projects: telephone calls made, things to check into, and so on.

It's hard to believe that a product called CoCo Cookbook can handle data management. Well, the fact is that Cookbook is really a general-purpose, free-form data manager at heart; you can think of the jargon peculiar to its recipe-storage application as having been tacked on after the fact. It should be possible to remove all specific references to cooking and thus customize the program, but I'll leave that for a future column.

CoCo Cookbook entries can be as long as 3,040 characters, but the program will only recognize parts of a 45-character title when performing a search. I wish Cookbook had more flexibility, but nothing's perfect. ■

Scott Norman is the manager of solid state science at GTE Laboratories in Waltham, MA, and has been a personal computer enthusiast for five years. Write to him at 8 Doris Road, Framingham, MA 01701.

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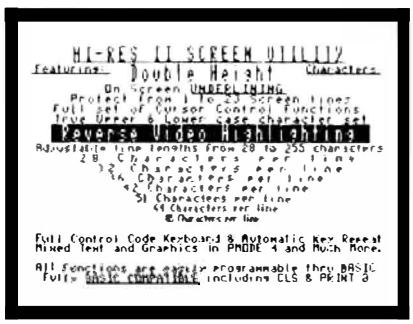
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Separate Text & Graphics	Yes	Yes	No
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Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Black	Buff/Black	Buff/Black
X,Y Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16,32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full ControlCode Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatability	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
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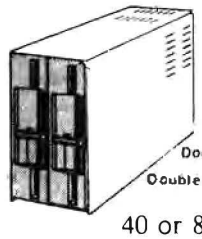

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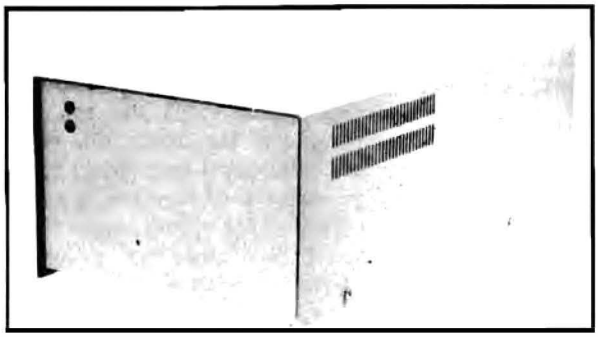

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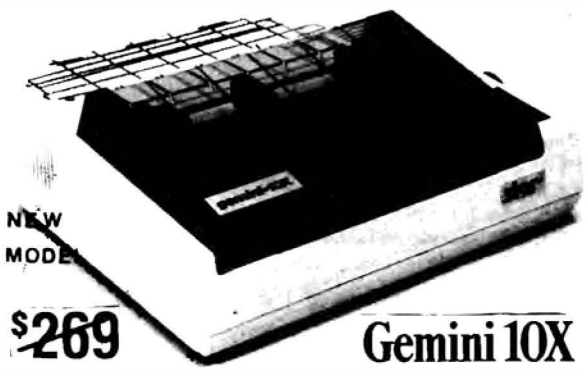

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REVIEW

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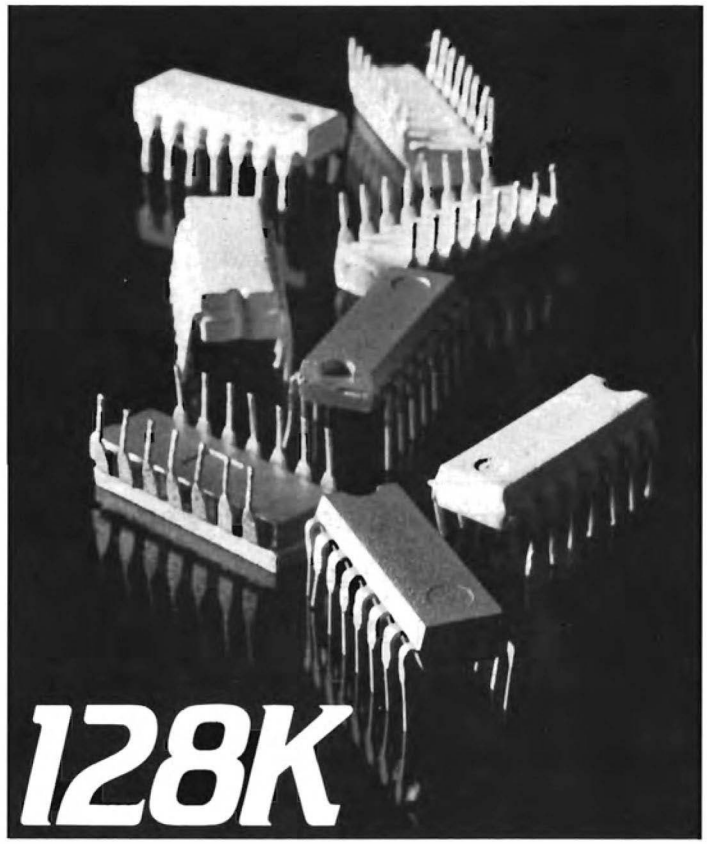

Photo by Edward Judice

In Search of 128K

Find out whether one of these two memory-expander kits will work for you.

Over the years, the Color Computer has experienced many significant hardware upgrades. One such upgrade currently making the rounds is memory-expansion kits that increase capacity to 96 or even 128K of RAM. Several brands of these kits have appeared recently on the market, and while they don't increase the space available to individual programs, they do open up a host of interesting possibilities. Memory upgrades let you keep two or three 32 to 64K programs loaded in RAM and ready to go. You can jump from one program to another by flipping a switch or by using one or two Basic commands.

This review describes my experience with expansion kits from Dynamic Electronics and DSL Computer Products. Because their approaches to treating the CoCo's expanded memory resources are different, this should give you a good overview of what is possible in memory upgrades. To begin, let's look at how a machine purported to peak at 64K is manipulated to handle larger blocks of memory.

The Expandable CoCo

The Color Computer can address only 64K of memory at one time. This limit is imposed by the addressing scheme used in the 6809 microprocessor and its support chips. But its setup still leaves room for invention. The 6883 SAM (synchronous-address multiplexer), which handles communications with the computer's memory, can assign the same addresses to different sets of chips at different times. This "bank selection" technique is the key to the Color Computer's memory expansion beyond 64K.

When the Color Computer is first turned on, it assigns the lower 32K of addresses to RAM. ROMs get 24K of the remainder, even with 64K RAM chips installed. Color Basic, Extended Color Basic, and Disk Extended Color Basic (or a ROM pack) each get 8K. The remaining 8K of addressspace is unused, except for a small segment assigned to I/O (input/output) devices, such as the keyboard, joystick ports, and so on. This memory setup is called Map Type 0.

You can also program CoCos with 64K of RAM for Map Type 1, which interprets all addresses, with the exception of those vital to I/O locations, as belonging to RAM. The ROMs are effectively switched out of the circuit, although it is possible to copy some of their code to RAM locations if it is needed. Map Type 1 is used by Flex and OS-9, and such popular applications programs as Telewriter-64, DynaCalc, and the VIP library. Perhaps the most exciting aspect of Map Type 1 is that it allows the SAM to handle a second bank of 64K.

The new memory-expander kits consist of logic circuits and additional RAM chips. This extra memory can be applied in two ways. The computer can treat the second bank as independent storage. In this mode an expanded CoCo becomes two 64K computers, although only one can run its resident program at a time. This is the approach taken by the Dynamic Electronics expander kit reviewed here.

The extra memory provided by some upgrade kits is divided into two "pages" or banks of 32K, residing at the lower addresses. It is possible to keep the Basic ROMs active while loading as many as three 32K programs into the computer at once: one in the lower 32K of the original RAM and two more in each half of the additional 64K of memory provided by the upgrade kit. The DSL expander uses this technique.

Kit Installation

Both of these memory expanders come with all soldering completed, but installation of the kits still requires care and effort. The installation procedure for Dynamic's ME-128-64, described here, is similar to that of DSL's 128K the Easy Way. First you remove 10 of your CoCo's ICs (integrated circuits): eight memory chips, the SAM, and one of the two PIAs (peripheral interface adapters). Eventually you reinstall these in new sockets that ride "piggyback" on additional chips (including a complete bank of RAM) plugged into the computer's circuit board. For the Dynamic, you must also drill a hole in your CoCo's case to install the bank-selection toggle switch.

The most difficult task for nonhobbyists is likely to be the removal of the 40-pin SAM and PIA. There isn't much room to maneuver your tools; factory-installed ICs of this size tend to fit very snuggly. I found it necessary to use a hobby knife followed by a thin screwdriver to open a little space between the chips and their sockets. Then I used a tweezer-style IC puller to extract the chips with a rocking motion while steadying the printed-circuit board with my free hand.

The 16-pin RAMs are easy to remove by comparison. Although the instruction sheet doesn't point this out, it is a good idea to observe the usual precautions against static electricity, which could harm your computer. Touch a grounded metal object before handling your chips. When you have pulled them out, keep them on a conducting surface, such as a sheet of aluminum foil.

When you have removed the original chips, insert the 10 new IC/socket assemblies. These chips plug into your board, and your original chips plug into them. A little care is required to ensure that they are properly oriented and that all the pins make contact with their sockets. Then you install the bank-selector switch (on the Dynamic ME-128-64) and replace the PIA and SAM. Dynamic recommends testing the new memory bank at this point, before you replace your original RAM chips. When you turn the computer on, only one bank will be properly initialized. It is necessary to throw the switch to the other side and press the reset button to initialize the second bank.

Dynamic offers a solution for purchasers whose nerve fails them; the company will do the upgrade for a modest fee. It is also possible to arrange for the loan of a computer while yours is in the shop for this modification.

The Dynamic ME-128-64

When you have concluded the installation, how do you use your 128K CoCo? The toggle switch provides one method for skipping between programs in the two memory banks. The Dynamic Electronics documentation also includes two POKEs that you can insert in Basic programs to perform the same function. The switch has a middle position that you use when you are running under program control.

Whenever you change banks, the program that was running is suspended, the values of all variables and pointers are saved, and the original RAM is placed in a reduced-power mode (drawing only about 10 percent of the power it normally uses). My E-board CoCo tends to run warm because of its many modifications, but I don't think the addition of the ME-128-64 has added any noticeable heat load.

The toggle switch is less reliable than POKE statements for transferring control, at least on my CoCo. The toggle works successfully several times in a row and then hangs up on the next attempt for no apparent reason. Bill Chapple from Dynamic Electronics acknowledges that the switch is probably susceptible to contact bounce—microscopic oscillations that can occur whenever a mechanical contact opens or closes.

Contact bounce is often interpreted by high-speed digital electronics as many closely spaced operations of the switch, and it is possible that the CoCo's circuitry can be fooled at some critical point. There are some simple ways of "debouncing" a switch through circuitry, but these methods are not incorporated in the current generation of 128K expanders.

The ME-128-64 was designed and tested for use with two copies of Cognitec's Telewriter-64 working on two different text files. I have switched banks from this configuration dozens of times without encountering a problem. Although this is a useful setup for me, it is specialized, and not for everyone. There are also some restrictions to the way you can switch memory banks. Dynamic has not tested the compatibility of the ME-128-64 with many other commercial programs. A fair amount of trial and error is necessary to see if two applications routines will run side by side.

Because the Color Computer has only one video-display generator chip and only one SAM to drive it, it does not let you pass control successfully from one bank to another unless both programs are in the same display mode. In other words, you cannot switch from a 32-column by 16-row text screen to high-resolution graphics. If you try to do so, the screen displays a meaningless pattern, and both programs are apt to hang up. It is usually safe to make a switch if both the active program and the one on standby

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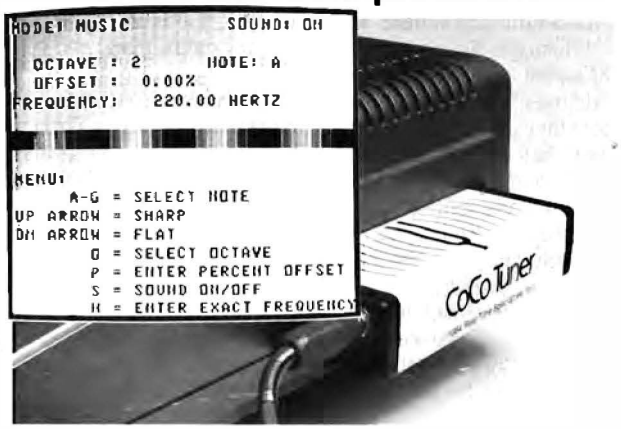

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are performing similar display operations at the time the transfer is made. But in truth, even this is not enough to guarantee success.

A few combinations of comercial programs work well together on the ME-128-64, and others just don't seem to get along. I was disappointed, for example, to discover that Telewriter and DynaCalc won't work together. Even though both programs use a 51-column by 24-line display, I can find no way to leave the spreadsheet and get into the word processsor's edit mode.

However, Chapple promises that he will explain in an upcoming issue of his newsletter how to pass variables between two Basic programs in the ME-128-64's separate banks of RAM. (The technique involves reconfiguring the PIA chips for output, a state in which they retain data that is POKEd into them.) That should make the ME-128-64 more valuable to the do-it-yourself programmer.

DSL's 128K the Easy Way

DSL's memory-expander board is called 128K the Easy Way. The first step in the installation of this board is removing the CoCo's SAM chip and reinstalling it on a small printed-circuit board that plugs into the original SAM socket. Then you remove the original 64K RAMs and reinstall them piggyback on the new set, just as for the Dynamic Electronics kit. Two clip-on leads connect the new SAM board to a pair of pins on one of the RAMs.

DSL's 128K the Easy Way does not use a toggleswitch for bank selection. You use POKE commands to switch in and out of memory segments. The new RAM is divided into two pages, each of which occupies the lower 32K of the CoCo's address range. These are designated by DSL's documentation as Page 1 and Page 2. The bottom half of the original 64K, the work space normally available in Basic, is called Page 0.

With this system there is a fourth 32K memory segment, the "high RAM," which is normally unavailable to the CoCo's Basic because it occupies the same space address as the ROMs. This space is accessible with the DSL kit and can be used to hold a control program or a copy of the Basic ROMs. The 20-page instruction booklet that comes with 128K the Easy Way includes Basic and Assembly-language versions of a page-changing routine that takes care of all bookkeeping chores, such as clearing space for strings and arrays and setting stack pointers for the various pages.

Like the Dynamic Electronics kit, 128K the Easy Way will find its niche initially with experienced programmers. Some commercially available software can capitalize on the new memory; the Star-DOS and XEX operating systems already work on the DSL product. And there is other software for 128K the Easy Way under development, including new basic interpreters, a word processor, and a database manager. People who want to write 128K software are invited to contact Dennis Lewandowski at DSL. The company is also publishing *The 128K Newsletter* selling at the subscription rate of $10 per year. Included in upcoming issues is an explanation by Dennis Derringer of Derringer Software on how to make Pro-Color File work on 128K the Easy Way.■

The ME-128-64 is manufactured by Dynamic Electronics Inc., P.O. Box 896, Hartselle, AL 35640, 205-773-2758. The company offers several models to cover all the board versions of the Color Computer ranging in price from $129 to $189. Dynamic's 96KX, not reviewed here, uses another method to give you extra memory and costs $59 ($49 in cartridge form). The 128K the Easy Way kit is manufactured by DSL Computer Products Inc., P.O. Box 1176, Dearborn, MI 48121, 313-582-8930. Models are available to fit all 64K CoCos and the CoCo 2 for $99.

Reviews

edited by J. Scot Finnie

Ed. note—In keeping with HOT CoCo's *new appearance, our review-rating system has undergone an overhaul to standarize reviewers' assessments. We have reduced the number of ratings from ten to six and given each a short description. The change is meant to make the reasoning behind ratings clearer for readers and reviewers alike. We have also added overall ratings to sum up our reviewers' impressions. Overall ratings are an average of the ratings for all the categories rounded to the nearest quarter of a rating point. The table below defines the new rating system.*

HOT CoCo's *New Review Ratings*

6	Unsurpassed
5	Excellent
4	Above Average
3	Acceptable
2	Needs Improvement
1	Unsatisfactory

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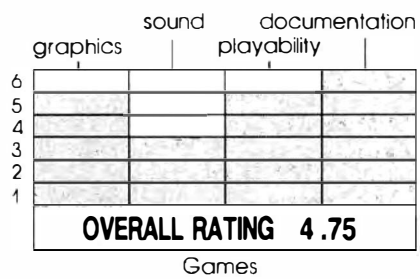
Caught Up in Star Trap

by Richard Ramella



When I was a child I saw a carom board game advertised as "100 games in one." It cost $10, which works out to only 10 cents a game. I sent for it and was not disappointed. It had checkers, chess, tiddly winks, carom billiards, puzzles, shuffleboard, and more. And it was based on little more than 80 game pieces and my imagination.

Star Trap's spirit of inventiveness evoked the memory of that carom board game when I sat down at the CoCo with my children to play it. Star Trap has some important basic features, including a maze, moving pieces, and sound keyed to game events. The most interesting feature of this program, however, is that it gives you numerous games in one. Players can change play levels, maze size, speed, among other parameters, and design their own mazes. I highly recommend the game for its intended audience, ages 7 and up.

Radio Shack calls Star Trap a "cooperative/strategy" game. It is a product of Radio Shack and the Children's Computer Workshop, an offshoot of the Children's Television Workshop, producers of *Sesame Street*. The game is not based on a violent premise. The object is to trap the star so that it can't move, not obliterate it. Two joystick-equipped players can work cooperatively to catch the star, rather than competing—a fresh approach.

The rules might seem complex at first, but children make early, satisfying plays without much knowledge of what to do. In time, they learn the finer points of play, too. The instruction booklet is very good: young children find it easy to understand. In the back of the booklet there are suggestions for non-computer activities with mazes, including blindfold travel of a labyrinth made of paper towels and a board-game version of a game called Fox and Geese.

The essence of Star Trap is a star on the loose in a maze. Players control a graphic symbol, which they use to pursue and trap the star. Two players can win by trapping the star between them. The graphic symbol can also leave a single X or a trail of Xs behind it that impede the constantly moving star. Other features of the maze are available through menu selection or in the higher levels. There are several gates that confer a new status on the star and the graphic symbol as they pass through them. Included among these are speed gates, slow gates, jump gates, invisible gates, and magic gates. The wily star is fast and can be tricky to catch. It amuses kids because it seems to take on its own personality.

If players tire of the form of the maze, they can set their ideas in motion by using a simple maze-building menu. You can set the maze to a small, medium, or large size. It can be black, green, or white. It's possible to set the star and graphic symbol separately at one of three speeds. Star Trap lets you combine five kinds of gates in any order. Play takes on a new look without maze walls. The total number of game variations possible in Star Trap is 124,416.

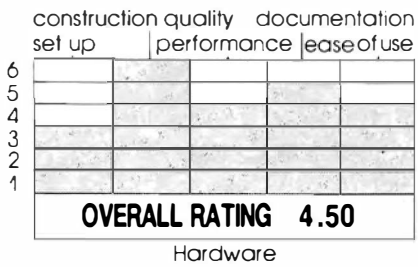
An Introductory-Level Screen on Star Trap

The 9-year-old member of my family test panel has played Star Trap daily for more than a week. To me this is a sure sign that Star Trap, like my old carom board game, passes the amortization test: Cost ÷ Number of Plays = Value. ■

Star Trap is packaged by Tandy Corp. (Catalog No. 26-2510), 1400 One Tandy Center, Fort Worth, TX 76102. It requires 16K, Extended Color Basic, and is available on cassette or disk. It sells for $19.95.

Monitoring The TV Buff IIc

by Gary W. Clemens



TV Buff IIc is an adapter circuit from Green Mountain Micro that you add to your CoCo in order to use a color or monochrome composite-video monitor. The monitor adapter is designed to intercept the video signal generated by the computer before it is converted to the RF (radio frequency) signal used by a television. The product lets you connect a monitor to your CoCo for a clean, interference-free picture that is far superior to its TV counterpart.

TV Buff IIc is made up of a small circuit board with eight color-coded wires and a ground wire. The circuit board has double-stick tape on its bottom to make mounting the card inside the computer easy. Although its advertising doesn't mention it, TV Buff IIc requires you to solder its wires to components inside the computer. You must also obtain a connector (most CoCos need a female phone plug, such as Radio Shack part number 274-337) and solder it to one of the wires. If you decide to install sound, you'll need a second jack.

You can set TV Buff IIc to use either a monochrome or a color monitor when you install it, but it can't be set for both at the same time. The video driver does allow simultaneous use of the TV and monitor outputs. You can get sound with TV Buff IIc through the cassette port or by hardwiring it for permanent installation.

Set Up

The installation procedure for this video driver is not complicated. However, because it requires soldering to components inside the Color Computer, you must be careful. If you have not used a soldering iron in electronics projects before, you should find someone to help you. You'll find that an extra pair of hands can be a real help.

Most of the soldering for TV Buff IIc's installation is done on the VDG (video display generator, part number MC6847P) chip, which you could damage accidentally if you are careless. The other items that you must solder are the output jacks and a ground point on the computer's circuit board. The instructions tell you to solder seven of the nine wires to the VDG, one to the output jack, and one to a ground point. For a permanent sound installation, you need to solder a capacitor between chip U3 and an output jack.

The instructions direct you to remove the VDG chip from its socket before you start soldering. This works fine for the earlier production models of the CoCo and CoCo 2 but might not be possible with newer versions, some of which have most of their components soldered into place. Green Mountain Micro needs to update TV Buff IIc's documentation to cover this possibility.

The last step in setting up TV Buff IIc is to run the output lead or leads outside the CoCo's case. The way you accomplish this depends for the most part on the size of the wires and jacks you select. I filed a small notch in the top of the computer's cover. But another method calls for a small diameter wire that you squeeze through the existing notch for the TV jack.

Documentation

TV Buff IIc's instructions guide you though the installation procedure step by step. Because you must choose between monochrome or color installation, the instructions provide you with guidance on each choice.

TV Buff IIc comes with seven pages of instructions. Three pages cover installation, two provide troubleshooting tips, and one has additional notes that discuss specifications, adding sound, and using surplus monitors. A separate page has a component layout and schematic diagram of TV Buff IIc. These instructions are excellent. They are easy to understand because they are not filled with technical jargon.

One shortcoming of the documentation is that it glosses over the instruction for installing sound. The sound section needs to be expanded to clarify, for example, how you use the cassette output to get sound. Connect the plug that normally goes to the auxiliary port of the cassette to the audio input of the monitor—not the cassette.

Customer support is an important part of any purchase. Green Mountain Micro gets high marks in this area. I had a question about the installation. When I called the company, I got the answer I needed from the first person I talked to, without a run-around or a hassle.

Ease of Use

Most TV Buff IIc owners will find that using the adapter once they have installed it is as easy as turning on their CoCos. If you have both a color and a monochrome monitor and want to switch back and forth, however, the changeover is difficult. You have to open up the computer and switch back and forth between the MC1372 chip and a resistor on the adapter board.

TV Buff IIc is a well-made piece of equipment. Its components are solidly attached to the board and loosen only with the application of determined force. One point to weigh before you buy TV Buff IIc concerns repairs to your CoCo. If you ever need to return you computer for servicing, you will have to unsolder and remove the adapter and reinstall it after the repairs have been completed.

Performance

The most important aspect of a video driver is how it measures up on your monitor's screen. I used TV Buff IIc with monochrome and color monitors and got surprisingly different results.

TV Buff IIc's monochrome quality was not as good as I expected. I compared the text output to that produced by other adapters on a brand-name, medium-resolution monitor with a well-known word processor in 50-, 64-, and 85-character modes. The characters that TV Buff IIc produces are fatter, and as a result, somewhat harder to read than those I have found with other adapter products. Nevertheless, the picture quality is plainly better than that of a good TV. My impression is that the picture is overdriven, but I couldn't discover any way to correct the problem.

The color-monitor mode produced different results. Because text is not the best application with which to judge color, I looked at more colorful applications. I preferred the TV Buff IIc with a color monitor to some other monitor adapters I've seen. The colors on the low-resolution color monitor I used were vivid and sharp, without any blotchiness or bleeding. The picture quality of TV Buff IIc with the monitor mentioned above was far superior to that of a color TV.

Neither the color nor the monochrome installation of the TV Buff IIc showed any signs of snow, ghosting, line interference, motor noise, or any of the many other problems associated with the use of a TV and a computer. The sound quality was consistent with what you normally hear from a TV. A minor note: I found that shielded cables aren't necessary for the video output. A good-quality unshielded patch cord works fine.

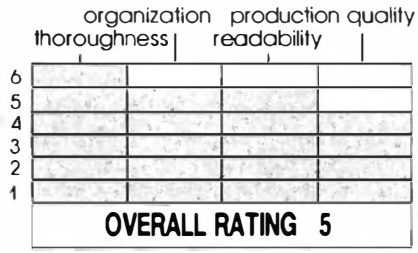
Summary

The TV Buff IIc is a good product. If you don't anticipate needing both monochrome and color output, it will serve you well. Although installation of TV Buff IIc is more difficult than that of some other video adapters, it is also more permanent. That can be an advantage. Some other adapters leave you wondering whether their connections are really tight enough. If you plan to do a lot of word processing on a monochrome monitor, check into another video driver. But if you are looking for a reliable video driver for your color monitor, this might be the one.■

TV Buff IIc is manufactured by Green Mountain Micro, Bathory Road, Box R, Roxbury, VT 05669, 802-485-6112. It sells for $19.95 plus $2.50 for shipping.

On *Color Computer Graphics*

by Richard Ramella



Books

Bill Barden, author of *Color Computer Graphics*, is the Color Computer's premier programming writer. When he shares his knowlewdge, beginners and experts alike learn new programming methods for the CoCo. *Color Computer Graphics* upholds this tradition. I recommend it to Color and Extended Color Basic programmers working at any level.

Color Computer Graphics provides the beginner with graphics essentials in sections that improve on the Color Computer's manuals. It lures the advanced programmer into experimentation. The best aspect of the work is its numerous short listings, which provide illustrative results after just a few moments of typing. The effect for those who work throught the text in a thoughtful and open-minded manner is a transformation from beginner into technical expert.

Barden's writing style is light-hearted and informative. His humor is disarmingly corny, as in the first chapter's claim that the book has a sequel titled *The Color Computer Meets the Mad Scientist*. This is writing in the tradition of David Lien's "classic" *TRS-80 User's Manual for Level I* on which many programmers cut their teeth in the late 1970's.

Color Computer Graphics has two sections. The first covers how to use graphics commands and the second explores programming techniques. The book also has a slick four-page center section of color screen photos showing results from listings given in the book. Barden has something for everyone. He does not, for example, skim over Color Basic, but covers it thoroughly in its own chapter. And he explains Extended Color Basic graphics methods so that almost everyone can understand them and begin using them creatively.

Color Computer Graphics has new ideas, such as if you create a circle with a large enough radius in Extended Color Basic, it flattens against the boundaries of the screen—making a box with a short command. The book's many interesting pointers include how to display extra colors in otherwise color-limited modes; how the draw command can give you many unusual shapes without using much memory; how to use serigraphic modes, the best of which lets you POKE eight colors into a 64-by-192 pixel resolution; how to produce precise rounded shapes with short commands.

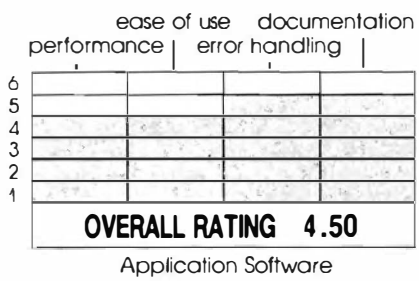
I have only one quibble with *Color Computer Graphics*—it was written backwards. It should start off with Color Basic and move into Extended Color Basic so that it is easy for beginners to follow. Instead, it begins with memory mapping, important theory but not the first concern of a beginning programmer. It moves from there into serigraphic modes, some of which the author mentions are there only to amaze. He even recommends that readers skip to later chapters if they lose interest in the first few chapters. Despite this shortcoming, the chapters themselves are well organized.

Be warned that no amount of technical expertise can turn anyone into a creative programmer. Barden shows you the fundamentals; it's up to you to find creativity by discovering how to combine graphics commands to create colors, shapes, and movement. *Color Computer Graphics* contains insightful tips and explanations throughout its many chapters. If you use this book to learn the essentials, the applications and execution will fall into place. ■

Color Computer Graphics *was written by William Barden, Jr. and is published by Tandy Corp., Fort Worth, TX 76102. 1982, softcover, 237 pp., $5.95.*

Meet Edittron

by Scott L. Norman



Application Software

It takes only a little program writing and debugging to make a believer out of you: Extended Color Basic's built-in line editor isn't ideal. Once you have worked with a word processor or other full-feature applications program, you become accustomed to the joys of full-screen editing, such as the ability to move the cursor freely over a screen of text, making changes wherever needed. The CoCo's standard editor limits you to working on a single program line at a time and could require you to specify a line number several times if major changes are needed. It is no surprise that one of the most popular accessories for programming in Basic is an enhanced editor.

Vidtron's Edittron is one. It offers 3K of machine language that you can load into any convenient spot (usually at the top of whatever RAM you have available) and put into action or sideline as you require. It might not be the most powerful program editor around, but it is simple to learn, and it works well.

The disk version reviewed here contains five copies of Edittron, any of which could be copied on an application disk. The stock program loads into RAM starting down at address $E00, putting it into conflict with Extended Color Basic's high-resolution graphics pages. Because it is written in relocatable code, however, it is easy to specify an offset when loading Edittron. The manual tells you how to do this. Owners of 64K machines have to use one of the map-changing utilities that copy the Basic ROMs into high RAM first.

The program that you want to edit must be in RAM before you can start Edittron. The documentation recommends loading the utility first, followed by the Basic program, and then typing the EXEC command to get Edittron running. You can use it as a programming editor when entering a new program from scratch if you resort to the following trick. Load Edittron as usual, then enter a dummy one-line Basic "program." Anything will do; the manual recommends that you type the line 10 A for simplicity.

Then you can type EXEC and go to work.

The Workings of Edittron

Edittron has two major modes of operation. The cursor-control mode comes up when you start up the utility. (You can return to Basic with the shift-clear key combination and restart Edittron with the EXEC command.) The commands in this mode move the cursor around a listing. You can use them to move in all four directions, scroll forward or backward by a screen at a time, go to home position on the current screen, and jump to a line number you specify or the top or bottom of the code. Each cursor-control command requires a single keystroke (except those that control scrolling by screens). The utility also gives you auto-repeat.

The search-the-line command finds the next occurrence of a character in the line on which the cursor is resting currently. The find-a-string command locates any combination of eight or fewer characters. It starts its search on the line below your current program line and continues through the end of the code. You use the find-a-string command in conjunction with the repeat-find command, a feature found in many word processors, to locate multiple occurrences of a character string. This is handy if you want to change the name of a variable wherever it appears in a long program. This command combination identifies only the first occurrence of your search characters on each program line. Examine complex program listings carefully.

"Edittron turned out to be the ideal tool for editing the DATA statements in my personal-finance program."

The cursor-control commands are fine for when you just want to nose around the code, but suppose you want to change things? Edittron's other mode, screen-editing, offers 10 helpful commands. Six of these use only a single keystroke each, and the other four use two-keystroke commands. The six single-keystroke commands let you change, insert, or delete characters within a Basic line and extend, remove, or move a line by assigning it a new number. The last command is the only one that gives you direct control over line numbers. You can't tinker with a line number by means of the character-changing command, for instance. That would probably play havoc with some of Basic's pointers.

The remaining screen-editing commands are "line oriented" instead of "character oriented." They allow you to split a single program line into two consecutively numbered segments, copy a line to a new location, merge any two consecutive lines, or automatically number new lines as you enter them.

Summary

Edittron runs smoothly. Its ability to make numerous changes to a line of code without having to leave the editor and retype the Edit command, a common occurrence with Color Basic, is welcome. It is true that you must sometimes use several Edittron commands to get the job done, and you must return to Basic to save any modifications you make,

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but these are minor shortcomings compared with the advantages the program provides.

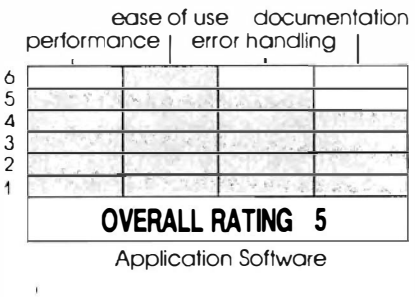
I have been using a personal-finance program for several years that stores my predictable bills and bank deposits in DATA statements and then plots a graph showing how my checking-account balance is likely to look during the next several weeks. The program was written back when I was still using cassette storage. I've since transcribed it for disk. I should rewrite it to take advantage of disk-file techniques, but I haven't had the time to do so. Edittron turned out to be the ideal tool for editing all those DATA statements. When I make a monthly payment, I use the routine to update the "Due Date" and shift the "Amount Due" to whatever I've predicted for my next month's bill. Edittron also helps by making it easy to search for names or dates.

Edittron has already found a home in this application on one of my frequently used disks. I recommend the routine highly.■

Edittron is manufactured by Vidtron, 4418 E. Chapman Ave., Suite 284, Orange, CA 92669, 714-639-4070. It runs on 16 to 64K CoCos and requires Extended Color Basic. It sells for $20 on cassette and $22 on disk.

Sideways with Side Wise

by Scott L. Norman



Do you use your Color Computer to generate w-i-d-e spreadsheets? Are you tired of compromising your high-tech printouts by using cellophane tape to hold them together? Then you might be interested in Side Wise, a nifty new utility from Derringer Software. Side Wise can read any ASCII disk file and signal a dot-matrix printer to print on a 90-degree angle so that the spreadsheet's rows are running parallel with the long dimension of the paper. The most common application for this feature might be a multi-columned spreadsheet that represents a long period of time.

There are some minor limitations. Side Wise limits printed lines to 255 characters, but that is enough for many purposes. The program also requires your printer to have dot-addressable graphics capability; the rotated characters are produced by a machine-

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language routine that works through the graphics codes. Side Wise comes with routines for driving Radio Shack's DMP series, Epson, C. Itoh, Okidata, and Gemini printers and their clones. These drivers should cover most installations. Author Dennis Derringer has offered to assist customers with making the program compatible with other printers or refund the purchase price of Side Wise.

The program disk contains two copies of a Basic program called Side and a machine-language routine named Wise. You can copy these on an applications program disk and use them in a single-disk system. Once Side Wise is in memory, you can exchange a data disk for the program disk.

Side Wise operation is easy. Typing RUN "SIDE" loads the program and brings up prompts for you to type in the printer and baud rate you want to use, and a main menu. The next step is to specify the name and drive number of the ASCII file you want to read and then stand back. Side Wise loads the file and displays the number of lines of text it contains. You can either specify the first and last lines for printing or just print the whole file if it will fit. Fitting means that the short dimension of a printed page (typically 8½ inches) is large enough to hold all the lines. The menu screen tells you how many lines will fit.

Side Wise's documentation also has a table of the number of printed lines it takes to cover the width of a page in both standard and compressed format (you select one of these two fonts with a toggled command) for each printer model the program supports. For example, my Epson FX-80 can print 48 lines in a single burst in standard font and 96 lines in the compressed mode. The C. Itoh Prowriter is the champ when it comes to packing in the data. It can stuff up to 108 compressed lines into a space 8½ inches high. If your file contains more data, you must enter additional start-line and end-line commands before printing each group of lines.

Once Side Wise has your printing under way, there is little to do but sit back, watch the show, and ponder the merits of the utility. One question that comes to mind is print quality. What do you give up by going sideways with Side Wise? The answer is speed and density. Side Wise prints in only one direction so you cannot get the equivalent of emphasized printing. In all probability the character set for your printer will not be the same as the one defined by your printer's ROM. The character set that Side Wise and my Epson produce is very pleasing, however. (See Fig. 1.) It is not likely that there are legibility problems with any of the printers that are compatible with Side Wise.

```
This text demonstrates the ability of Side
Wise to print and ASCII file sideways.  It was
prepared with the ASCII I/O option of Telewriter
64 and stored on disk for the Derringer program.
One note of caution: do not use embedded control
characters--they will not be properly interpretted
by Side Wise.
```

Fig. 1. The Side Wise Character Set on the Epson FX-80

There are some procedures to remember when using Side Wise with applications programs. For the most part these concern setting line length. If you want Side Wise to print 150 characters wide, remember to specify it wherever it is appropriate in your application program. For example, before producing an ASCII file with DynaCalc's output-to-disk-file command, you should change the paramater for width of a printed page. If you don't, Side Wise generates 80 columns of spreadsheet turned on its side. The attributes command, /A, gives you the appropriate options. The complete com-

mand string for a 150-character spreadsheet is /APW150.

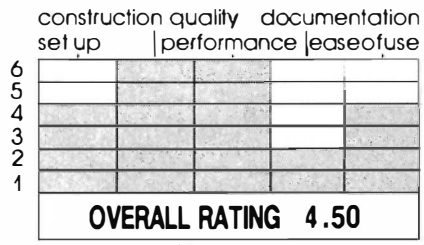
You should also change the line length if you want to use Side Wise to print a file you wrote with your word processor. Side Wise does not recognize imbedded control characters, so get rid of them before saving the file to disk. For example, you must strip TeleWriter-64 documents of all font-control commands introduced by a caret (^). If you leave them in, you will receive an odd, near verbatim printout as the program struggles to interpret the carets and other commands. Side Wise does not recognize left-margin settings. The simplest way to have your printout start 10 spaces from a page break is to advance the paper 10 lines past the print head manually before you begin.

I gleaned these last few points while using Side Wise in several successful practice sessions. Don't let them deter you. Side Wise works well and is easy to use. It is also a unique program in the Color Computer world.■

Side Wise is manufactured by Derringer Software Inc., P.O. Box 5300, Florence, SC 29502-2300, 803-665-5676. It requires a disk drive and sells for $19.95.

RGS Dual DOS Card

by Gary W. Clemens



The Dual DOS Card from RGS Micro Inc. lets you access two ROMs or a ROM and an EPROM without opening your disk controller to switch ICs (integrated circuits). The product was designed to plug into the ROM socket of J&M's JDOS Disk Controller (it won't fit in the Radio Shack controller) and has two additional sockets and an external switch. It comes in two configurations. You can get two 24-pin sockets for two ROMs or two 28-pin sockets that can hold a 24-pin ROM and a 24- or 28-pin ROM or EPROM. This gives you the option of having DECB (Disk Extended Color Basic) and JDOS, or a DOS and an EPROM of your choice at your fingertips. If you buy the 24/28-pin configuration, you have to modify the card to use a 28-pin chip.

Construction and Setup

The Dual DOS Card is durable and well-

Continued on p. 72

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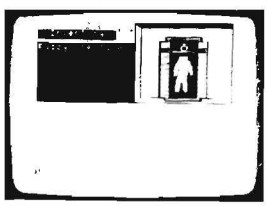

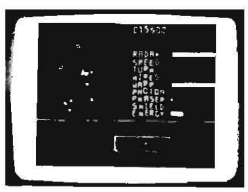

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by Richard E. Esposito and Raymond W. Rowe

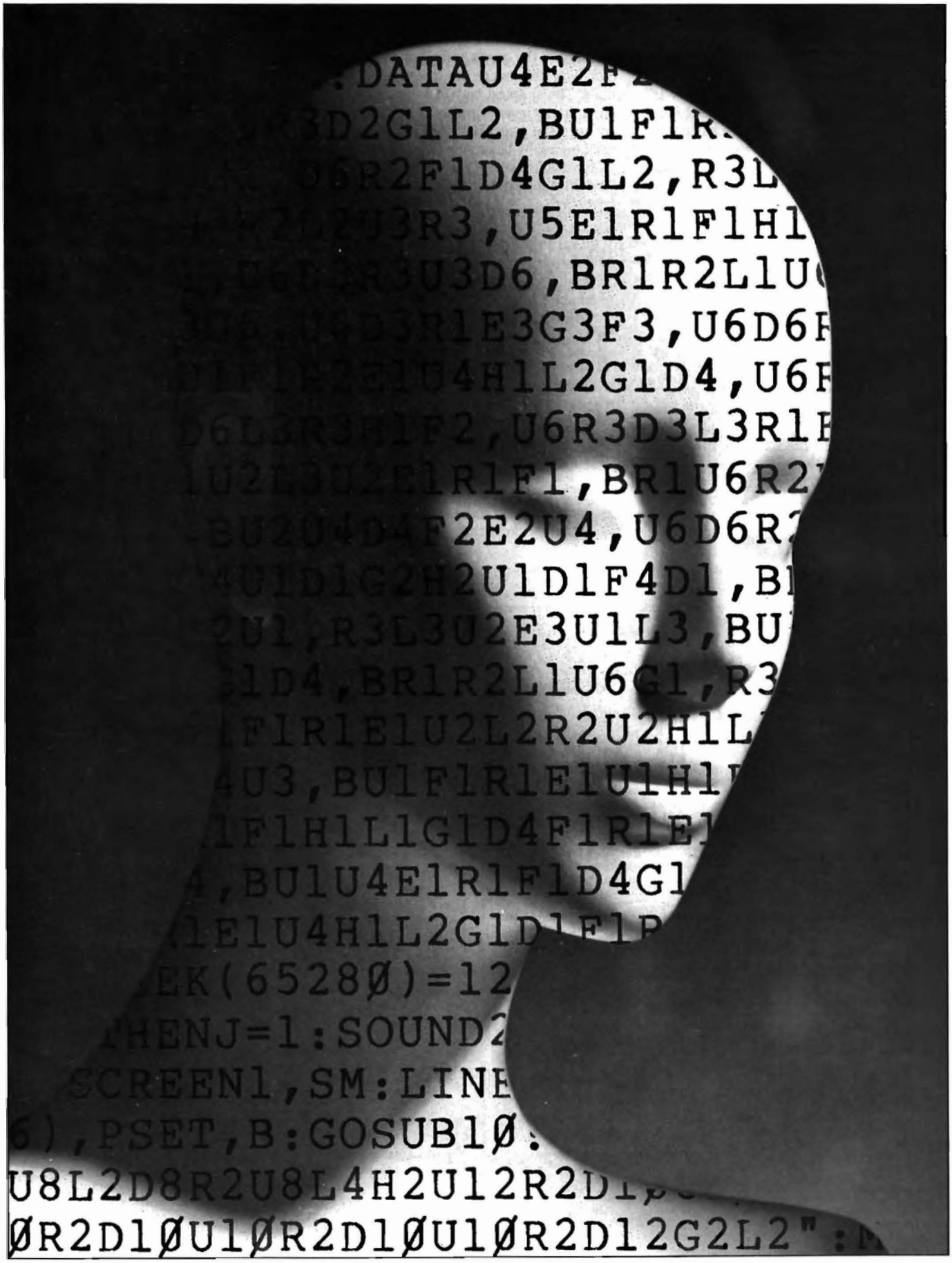

Photo by Edward Judice

64K Modification Revisited

Get the scoop on upgrading your CoCo no matter what version you have.

Still struggling with 32, 16, or even 4K of memory in your Color Computer? In most cases, increasing your CoCo's memory capacity is easy enough for anyone with the confidence to try.

Some upgrading techniques, however, are too involved for novices. Opening your Color Computer voids its warranty, and if you make a mistake such as cutting a land on a printed circuit (PC) board, your local Radio Shack technician might refuse to service it. Each upgrade method in this article is rated for level of difficulty.

When RadioShack was charging $150 for the 64K RAM chip set, the do-it-yourself upgrade could save the user up to $100—worth risking damage to the CoCo. Today the savings are less, so if anything in this article is not clear to you, don't go ahead with the procedure. A wrong assumption could be costly. Read all instructions thoroughly and make sure the modification does not exceed your level of experience. And make sure you have all the parts on hand.

Ground Rules

Chips are numbered counterclockwise from the notch (Fig. 1). Where soldering is called for, use a 25- to 40-watt iron with small-guage (71 mm. is fine), 50/50 or 60/40 rosin-core solder. Where wire is called for, use 30-guage insulated wire. Where 4164 dynamic RAMs are called for, they must be of the 128-cycle variety. NEC chips are suitable, but TMS chips will not work because they require a 256-cycle refresh.

The difficulty ratings are easy (no soldering required), moderate (some soldering required), and difficult (cutting of lands or desoldering necessary).

Use the following procedure to prepare your CoCo for each upgrade modification. Open the CoCo by turning it upside down and removing the five (six on the CoCo 2) screws. Be sure to remove the screw under the warranty seal. Place a piece of masking tape over each hole so you won't lose the screws. Turn the machine upright and lift off the top.

Unplug the keyboard and put it aside. After clipping the two plastic cable ties, remove the metal shield covering the section of the board that contains the 6809 CPU (central processing unit), 6883 SAM (synchronous address multiplexor), the 6821 PIAs (peripheral interface adaptors), the 6847 VDG (video display generator), and the memory chips. (Note: The CoCo 2 may not have a shield.)

4K to 16K—Easy

This modification applies only to C, D, or E boards.

Remove the metal shield. The eight 4K RAMs are identified as U20 to U27 on the board. Replace these with 4116 dynamic RAMs, making sure that the rounded notches on the chips match the notches on the sockets. (The notches point toward the rear of the computer.)

Move all jumpers to the 16K position. Replace the shield and close up the machine and you are done.

Continued on p. 54

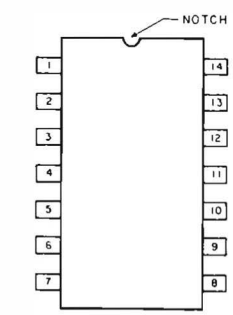

Fig. 1. Chip Pin Location

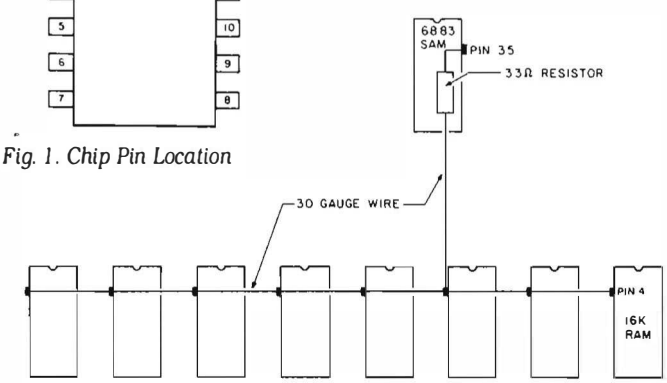

Fig. 2. The Piggyback Upgrade

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by Jim McDowell and Shawn Diehl

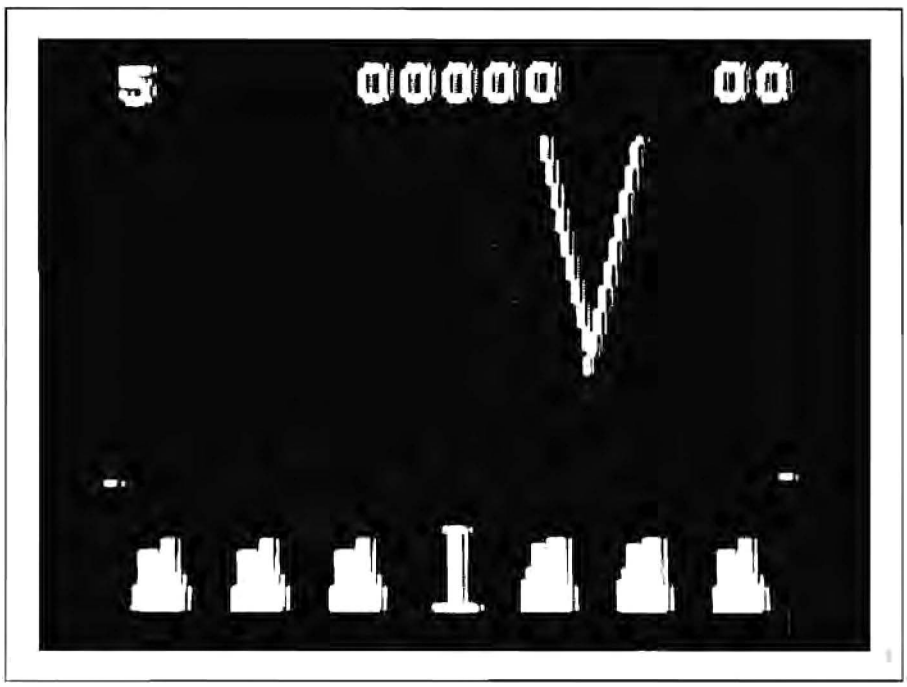
Missile Defense

The aliens are back, and boy are they mad.

Missile Defense II picks up the theme of the arcade game Missile Command. The object of the game is to defend your six cities from attack by missiles and aliens. There are five different skill levels, each increasing in speed and score values.

The joystick moves a sighting cursor and the joystick button fires your laser. To hit a missile, place the sighting cursor directly on or below the leading edge of the missile. To hit an alien, aim the cursor at the off-colored pixels on each alien.

Any missiles that are not hit will continue down the screen until they hit a city or the ground near a city. Aliens you do not hit will attack your laser turret and penalize you by stealing some of your extra cities. You lose the game if you do not have any extra cities, if all your cities are destroyed, or if a missile penetrates the ground near a city.



Loading Missile Defense

Missile Defense is made up of two separate programs: the main program, Defense 2 (Listing 1), and its controlling Basic loader program (Listing 2). To load Missile Defense, type in and save Lisitng 1. (Due to memory limitations, users with 16K systems must type PCLEAR 2 before entering Listing 1.) Then enter the Basic loader by typing in Listing 2 after entering CLEAR 200,&H3D00. Note: 16K users must unplug the disk controller in order to have sufficient memory.

System Requirements

16K RAM
Extended Color Basic
Joystick

The Basic loader saves the machine code on tape or disk. On disk systems, the loader will automatically save the machine code to Drive 0. If you use tape, use Listing 2 to generate the machine code and then save that code directly after Listing 1.

Special Features

You can make the game more competitive. Defense II includes a top-ten scoring routine which allows you to modify the program through the use of an auto-disk save. With it you can record the scores of the top ten players. To take advantage of this feature, remove the remark symbol from line 2630, but first be certain that line 1090 is exactly as written in Listing 1, since it is vital to the save routine. For a bigger challenge at a higher speed, activate the POKE switch in line 1280 by removing the remark symbol.

Our best score is 25,786. Try to beat it!■

See program listing on page 48

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HOT CoCo's Pull-Out Program Listings

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All program listings are available on our Instant CoCo cassette.

64K Modification Revisited

Program Listing 1.

Memory Test

```
1Ø FOR I= 32382  TO  324Ø7
2Ø READ X
3Ø POKE I,X
4Ø NEXT I
5Ø EXEC32382
6Ø DATA  26,8Ø,142,128,Ø,166,132
,183
7Ø DATA  255,223,167,128,183,255
,222,14Ø
8Ø DATA  255,Ø,38,241,183,255,22
3,28
9Ø DATA  175,57
1ØØ CLS:PRINT
11Ø PRINT"E-BOARD TEST - E"
12Ø PRINT "WRITE TO ROM AREA - R
"
13Ø PRINT"WHICH ONE?";
14Ø A$=INKEY$:IFA$="" THEN 14Ø
15Ø PRINTA$
16Ø IF A$="R" THEN 24Ø
17Ø IF PEEK(49152)=68 THEN S=&HE
ØØØ ELSE S=&HCØØØ
18Ø FOR I=S TO &HFEFF
19Ø POKEI,Ø: IF PEEK(I)<>Ø THEN
PRINT"TEST FAILS AT $";HEX$(I):G
OTO11Ø
2ØØ POKEI,255: IF PEEK(I)<>255 T
HEN PRINT"TEST FAILS AT $";HEX$(
I):GOTO11Ø
21Ø PRINT@Ø,HEX$(I):NEXTI
22Ø PRINT"E-BOARD TEST CHECKS OK
": PRINT
23Ø GOTO11Ø
24Ø POKE&HA147,99
25Ø IF PEEK(&HA147)<>99 THEN PRI
NT"TEST FAILS":GOTO11Ø
26Ø PRINT"OS-9, FLEX, 64K CHECKS
 OUT": PRINT
27Ø GOTO11Ø
```

Program Listing 2.

64K Enable

```
1Ø REM ENABLE 64K AND COPY BASIC
 INTO RAM
2Ø FOR I= 32382  TO  324Ø7
3Ø READ X
4Ø POKE I,X
5Ø NEXT I
6Ø EXEC32382
7Ø DATA  26,8Ø,142,128,Ø,166,132
,183
8Ø DATA  255,223,167,128,183,255
,222,14Ø
9Ø DATA  255,Ø,38,241,183,255,22
3,28
1ØØ DATA  175,57
11Ø REM RESET PROTECTION
12Ø POKE&HAØ55,&HØD
13Ø FOR I=&HAØ68 TO &HAØ71
14Ø POKE I,&H12
15Ø NEXT I
16Ø REM USE RESET VECTOR
17Ø A1=PEEK(114): A2=PEEK(115)
18Ø POKE114,Ø :POKE115,&HF8
19Ø POKE&HF8,&H12
2ØØ POKE&HF9,&H7F: POKE&HFA,&HFF
: POKE&HFB,&HDF
21Ø POKE&HFC,&H7E: POKE&HFD,A1:
POKE&HFE,A2
22Ø PRINT"BASIC NOW IN RAM"
23Ø POKE 44Ø14,ASC("o")
24Ø POKE 44Ø15,ASC("k")
```

The 80K Color Computer

Program Listing 1. Bank Switching Utility

```
5 CLEAR 1ØØ,323ØØ
1Ø FOR I=65Ø68 TO 65Ø68+172
2Ø READ A$:POKE I,VAL("&H"+A$):N
EXTI
25 RESTORE
3Ø FOR I=323ØØ TO 323ØØ+172:READ
 A$:POKE I,VAL("&H"+A$)
4Ø NEXTI
41 RESTORE
42 DEFUSRØ=323ØØ:DEFUSR1=32326
45 IFPT>Ø THEN 54
47 PT=1
5Ø XX=USRØ(Ø)
52 GOTO1Ø
54 POKE&HFFDE,1
55 YY=USR1(Ø)
6Ø END
199 'ML SUBROUTINE 1
2ØØ DATA1A,5Ø,8E,8Ø,ØØ,A6,84,B7
21Ø DATAFF,DF,A7,8Ø,B7,FF,DE,8C
22Ø DATAFF,ØØ,26,F1,B7,FF,DF,1C
23Ø DATAAF,39
235 'ML SUBROUTINE 2
24Ø DATA1A,5Ø,8E,ØØ,ØØ,1Ø,8E,ØØ
25Ø DATAØØ,A6,8Ø,B7,FF,D5,A7,AØ
26Ø DATAB7,FF,D4,1Ø,8C,8Ø,ØØ,25
27Ø DATAFØ,1C,AF
275 'ML SUBROUTINE 3
28Ø DATAB7,FF,D5,86,39,B7,Ø1,67
29Ø DATAB7,FF,C6,B7,FF,C9,B7,FF
3ØØ DATACA,B7,FF,CC,B7,FF,CE,B7
31Ø DATAFF,DØ,B7,FF,D3,39
315 'ML SUBROUTINE 4
```

Listing continued

Listing continued

```
32Ø DATAB7,FF,D4,86,7E,B7,Ø1,67
33Ø DATAB7,FF,C6,B7,FF,C9,B7,FF
34Ø DATACA,B7,FF,CC,B7,FF,CE,B7
35Ø DATAFF,DØ,B7,FF,D2,39
355 'ML SUBROUTINE 5
36Ø DATA1A,5Ø,8E,ØØ,ØØ,1Ø,8E,ØØ
37Ø DATAØØ,A6,8Ø,B7,FF,D5,A7,AØ
38Ø DATAB7,FF,D4,1Ø,8C,Ø5,FF,25
39Ø DATAFØ,1C,AF,7E,7E,61
395 'ML SUBROUTINE 6
4ØØ DATA1A,5Ø,8E,ØØ,ØØ,1Ø,8E,ØØ
41Ø DATAØØ,A6,8Ø,B7,FF,D4,A7,AØ
42Ø DATAB7,FF,D5,1Ø,8C,Ø5,FF,25
43Ø DATAFØ,1C,AF,7E,7E,7F
```

Program Listing 2. Bank Switching Utility. Assembly Version

```
                        00090 *MACHINE LANGUAG SUBROUTINE 1
7E2C                    00095         ORG     $7E2C
7E2C 1A   50            00100         ORCC    #$50     INHIBIT INTERRUPTS
7E2E 8E   8000          00110         LDX     #$8000   START OF ROM
7E31 A6   84            00120 LOOP1   LDA     ,X       GET ROM BYTE
7E33 B7   FFDF          00130         STA     $FFDF    MAP1
7E36 A7   80            00140         STA     ,X+      STORE BYTE, INCREMENT X
7E38 B7   FFDE          00150         STA     $FFDE    MAP0
7E3B 8C   FF00          00160         CMPX    #$FF00   ALL ROM COPIED?
7E3E 26   F1            00170         BNE     LOOP1    LOOP IF NO
7E40 B7   FFDF          00180         STA     $FFDF    LEAVE MAP 1 RUNNING
7E43 1C   AF            00190         ANDCC   #$AF     ENABLE INTERRUPTS
7E45 39                 00200         RTS
                        00210 *MACHINE LANGUAGE SUBROUTINE 2
7E46 1A   50            00220         ORCC    #$50
7E48 8E   0000          00230         LDX     #$0      INITIALIZE REGISTERS
7E4B 108E 0000          00240         LDY     #$0      TO BOTTOM OF RAM
7E4F A6   80            00250 LOOP2   LDA     ,X+      GET BYTE, INC. X
7E51 B7   FFD5          00260         STA     $FFD5    SELECT RAM BANK TWO
7E54 A7   A0            00270         STA     ,Y+      STORE BYTE, INC. Y
7E56 B7   FFD4          00280         STA     $FFD4    SELECT RAM BANK 1
7E59 108C 8000          00290         CMPY    #$8000
7E5D 25   F0            00300         BLO     LOOP2
7E5F 1C   AF            00310         ANDCC   #$AF
                        00320 *MACHINE LANGUAGE SUBROUTINE 3
7E61 B7   FFD5          00330         STA     $FFD5    EXIT IN RAM BANK 2
7E64 86   39            00340         LDA     #$39     DISABLE SUBROUTINE WHICH
7E66 B7   0167          00350         STA     $167     RESETS VIDRAM TO PAGE2
7E69 B7   FFC6          00360         STA     $FFC6    SET VIDRAM REGISTER
7E6C B7   FFC9          00370         STA     $FFC9    TO BIT PATTERN
7E6F B7   FFCA          00380         STA     $FFCA    1000010
7E72 B7   FFCC          00390         STA     $FFCC
7E75 B7   FFCE          00400         STA     $FFCE
7E78 B7   FFD0          00410         STA     $FFD0
7E7B B7   FFD3          00420         STA     $FFD3
7E7E 39                 00430         RTS
                        00440 *MACHINE LANGUAGE SUBROUTINE 4
7E7F B7   FFD4          00450         STA     $FFD4    SELECT BANK 1
7E82 86   7E            00460         LDA     #$7E     ENABLE ROM SUBROUTINE
7E84 B7   0167          00470         STA     $167     TO RESETVIDEO RAM TO PAGE 2
7E87 B7   FFC6          00480         STA     $FFC6    SET VIDRAM
7E8A B7   FFC9          00490         STA     $FFC9    REGISTER TO
7E8D B7   FFCA          00500         STA     $FFCA    BIT PATTERN
7E90 B7   FFCC          00510         STA     $FFCC    0000010
7E93 B7   FFCE          00520         STA     $FFCE
7E96 B7   FFD0          00530         STA     $FFD0
7E99 B7   FFD2          00540         STA     $FFD2
7E9C 39                 00550         RTS
                        00560 *MACHINE LANGUAGE SUBROUTINE 5
7E9D 1A   50            00570         ORCC    #$50
7E9F 8E   0000          00580         LDX     #$0
7EA2 108E 0000          00590         LDY     #$0
7EA6 A6   80            00600 LOOP3   LDA     ,X+
7EA8 B7   FFD5          00610         STA     $FFD5
7EAB A7   A0            00620         STA     ,Y+
7EAD B7   FFD4          00630         STA     $FFD4
7EB0 108C 05FF          00640         CMPY    #$5FF
7EB4 25   F0            00650         BLO     LOOP3
7EB6 1C   AF            00660         ANDCC   #$AF
7EB8 7E   7E61          00670         JMP     $7E61
                        00680 *MACHINE LANGUAGE SUBROUTINE 6
7EBB 1A   50            00690         ORCC    #$50
7EBD 8E   0000          00700         LDX     #$0
7EC0 108E 0000          00710         LDY     #$0
7EC4 A6   80            00720 LOOP4   LDA     ,X+
7EC6 B7   FFD4          00730         STA     $FFD4
7EC9 A7   A0            00740         STA     ,Y+
7ECB B7   FFD5          00750         STA     $FFD5
7ECE 108C 05FF          00760         CMPY    #$5FF
7ED2 25   F0            00770         BLO     LOOP4
7ED4 1C   AF            00780         ANDCC   #$AF
7ED6 7E   7E7F          00790         JMP     $7E7F
          0000          00800         END
00000 TOTAL ERRORS


LOOP1   7E31
LOOP2   7E4F
LOOP3   7EA6
LOOP4   7EC4
```

Program Listing 3. Basic Transfer Demonstration

```
1ØØ CLS:PRINT"THIS SECTION OF TH
E PROGRAM IS EXECUTED IN THE FIR
ST RAM BANK."
11Ø INPUT"<ENTER> TO GO TO THE S
ECOND RAM BANK";AN$
12Ø EXEC 32413
13Ø CLS:PRINT"THIS SECTION IS EX
ECUTED IN THE SECOND BANK."
135 INPUT"<ENTER>TO RETURN TO BA
NK ONE";AN$
14Ø EXEC 32443
15Ø CLS:PRINT"NOW YOU ARE BACK W
HERE YOU STARTED IN THE FIRST RA
M BANK
```

Doctor ASCII

Program Listing 1. PUTLDR

```
1Ø ' PUTLDR.BAS V1.Ø
2Ø CLEAR 1ØØØ
3Ø CLS:PRINT" PUTLDR PROGRAM"
4Ø PRINT"       BY
5Ø PRINT"   J.W.JACKSON
6Ø PRINT"       FOR
7Ø PRINT"   HOT COCO
8Ø PRINT"   <C> 1984
9Ø IF YC>Ø THEN 14Ø
1ØØ REM  ADDS AN AUTOMATIC LOADE
R
11Ø REM  TO A BINARY FILE ON DIS
K
12Ø REM  SO THAT WHEN THE FILE I
S
13Ø REM LOADM'D,IT AUTO STARTS.
14Ø PRINT:PRINT"SELECT OPTIONS"
15Ø PRINT"1. DISPLAY FILE ADDRES
SES
16Ø PRINT"2. PUT AUTO LOADER
17Ø PRINT"3. REMOVE AUTO LOADER
18Ø PRINT"4. QUIT
19Ø INPUT" YOUR CHOICE <1,2,3,4>
 ";YC
2ØØ IF YC<4 THEN GOSUB27Ø:IF FE=
ØTHEN3Ø
21Ø IF YC<1 OR YC>4 THEN 3Ø
22Ø IF YC=3 THEN UN$="Y" ELSE UN
$="N"
23Ø ON YC GOSUB 36Ø,62Ø,38Ø,26Ø
24Ø IF YC=2 OR YC=3 THEN GOSUB 3
6Ø
25Ø GOTO3Ø
26Ø END'**********************
27Ø CLS:PRINT"ENTER FILENAME":PR
INT" <DRIVE:>FILENAME</EXT>":LIN
E INPUT"? ";A$
28Ø CØ=INSTR(1,A$,":")
29Ø IF CØ<3 THEN 32Ø
3ØØ DR$=MID$(A$,CØ+1,1)
31Ø A$=DR$+":"+LEFT$(A$,CØ-1)
32Ø IF (INSTR(1,A$,"/") = Ø AND
INSTR(1,A$,".") = Ø) THEN A$=A$+
"/BIN"
33Ø GOSUB81Ø'CHECK FILE EXISTS
34Ø IF FE=Ø THEN GOSUB 96Ø:RETUR
N
35Ø RETURN
36Ø GOSUB38Ø'GET FILE ADDRESSES
37Ø INPUT" PRESS A KEY ";ZZ$:RET
URN
38Ø EA=Ø:L=Ø:S=Ø:OS=1:UA=Ø'GET F
ILE ADDRESSES
39Ø OPEN "D",#1,A$,1
4ØØ FIELD #1,1 AS B$
41Ø GET #1,OS:TI=ASC(B$)
42Ø GET #1,1+OS:LH=ASC(B$)
43Ø GET #1,2+OS:LL=ASC(B$):L=LH*
256+LL
44Ø GET #1,3+OS:AH=ASC(B$)
45Ø GET #1,4+OS:AL=ASC(B$):A=AH*
256+AL
46Ø IF TI=255THENT=A:TH=AH:TL=AL
:GOTO52Ø
47Ø IF UN$="Y" AND TI=ØØ THEN IF
 A=159 THEN UA=OS
48Ø IF EA=Ø OR EA=A THEN 49Ø ELS
E GOSUB59Ø:GOSUB58Ø
49Ø EA=A+L
5ØØ IF S=Ø THEN GOSUB 56Ø:GOSUB5
8Ø
51Ø IF TI=ØØ THEN S=S+L:OS=L+5+O
S:GOTO41Ø
52Ø IF UN$="Y" AND UA>Ø THEN GOS
UB73Ø'REMOVE LOADER
53Ø CLOSE #1
54Ø GOSUB 59Ø:GOSUB6ØØ
55Ø PRINTSTRING$(3Ø,"*"):RETURN
56Ø GOSUB 55Ø:PRINTA$," HEX/ DEC
"
57Ø PRINTSTRING$(3Ø,"*"):RETURN
58Ø PRINT"LOADS",HEX$(A)"/"A:RET
URN
```

Listing continued

```
59Ø PRINT"ENDS",HEX$(EA)"/"EA:RE
TURN
6ØØ PRINT"EXEC",HEX$(T)"/"T
61Ø PRINT"SIZE",HEX$(S)"/"S:RETU
RN
62Ø GOSUB38Ø:FL=OS'PUT LOADER
63Ø OPEN "D",#1,A$,1
64Ø FIELD #1,1 AS B$
65Ø RESTORE
66Ø FOR I=ØTO23
67Ø READ B
68Ø LSET B$=CHR$(B)
69Ø PUT #1,FL
7ØØ FL=FL+1
71Ø NEXT I
72Ø GOTO76Ø
73Ø FL=UA'REMOVE LOADER
74Ø BB$=CHR$(255):GOSUB8ØØ
75Ø BB$=CHR$(Ø):GOSUB8ØØ:GOSUB8Ø
Ø
76Ø BB$=CHR$(TH):GOSUB8ØØ
77Ø BB$=CHR$(TL):GOSUB8ØØ
78Ø CLOSE #1
79Ø RETURN
8ØØ LSET B$=BB$:PUT #1,FL:FL=FL+
1:RETURN
81Ø AA$=A$'CHECK IF FILE EXISTS
82Ø CO=INSTR(1,AA$,":")
83Ø IF CO>Ø THEN DR$=LEFT$(AA$,C
O-1) :DR=VAL(DR$):AA$=RIGHT$(AA$
,LEN(AA$)-CO)
84Ø IF CO=Ø THEN DR=PEEK(&HEB)
85Ø SL=INSTR(2,AA$,"/")
86Ø IF SL>ØTHEN88Ø
87Ø SL=INSTR(2,AA$,"."):IF SL=Ø
THEN 89Ø
88Ø L=LEN(AA$):AA$=LEFT$(AA$,SL-
1)+STRING$(9-SL," ")+RIGHT$(AA$,
L-SL)
89Ø FOR I=3 TO 11
9ØØ DSKI$ DR,17,I,Z1$,Z2$
91Ø Z1$=LEFT$(Z1$,128)+LEFT$(Z2$
,127)
92Ø IF INSTR(1,Z1$,AA$)<>Ø THEN
FE=1:GOTO95Ø
93Ø NEXT I
94Ø FE=Ø' FILE DOESN'T EXIST
95Ø RETURN
96Ø CLS(Ø):PRINT"FILE "A$" NOT O
N DISK"
97Ø PRINT" PRESS A KEY";
98Ø IF INKEY$=""THEN98Ø
99Ø RETURN
1ØØØ DATA ØØ,ØØ,16,ØØ,159
1Ø1Ø DATA 15,112,15,113,18
1Ø2Ø DATA 32,Ø2,173,174,127
1Ø3Ø DATA 255,64,11Ø,159,ØØ,157
1Ø4Ø DATA 255,ØØ,ØØ,ØØ,159
1Ø5Ø END' PUTLDR.BAS
```

Mindbusters

Program Listing 1. Fifteen Puzzle

```
1ØØ REM * ORIGINAL FIFTEEN PUZZL
E *
11Ø REM * TRS-8Ø EXTENDED COLOR
BASIC 16K / RAMELLA
12Ø CLS: CLEAR 5ØØ: DIM A$(4)
13Ø A$(1)=" 1  2  3  4"
14Ø A$(2)=" 5  6  7  8"
15Ø A$(3)=" 9 1Ø 11 12"
16Ø A$(4)="13 14 15   "
17Ø F$=A$(1)+A$(2)+A$(3)+A$(4):
N=1: S$=STRING$(32,32)
18Ø X=1Ø: Y=4: C$=STRING$(2,32):
D$="AZ,."
19Ø GOSUB 33Ø: PRINT: INPUT "HOW
MANY DISPLACEMENTS";Q: PRINT @
16Ø,S$;
2ØØ FOR R=1 TO Q
21Ø B$=MID$(D$,RND(4),1)
22Ø IF B$="A" AND E$="Z" OR B$="
Z" AND E$="A" OR B$="," AND E$="
." OR B$="." AND E$="," THEN21Ø
23Ø PRINT @ 196,"DISPLACE:"N
24Ø GOSUB 29Ø: IF J=Ø THEN 21Ø E
LSE J=Ø: N=N+1: E$=B$: GOSUB 33Ø
: NEXT R: PRINT @ 196,S$;
25Ø B$=INKEY$: IF INSTR(D$,B$)>Ø
THEN GOSUB 29Ø ELSE 25Ø
26Ø GOSUB 33Ø
27Ø IF F$=A$(1)+A$(2)+A$(3)+A$(4
) THEN PRINT @ 235,"YOU WIN": FO
R J=1 TO 5Ø: SOUND RND(13)*13,1:
NEXT J: END
28Ø GOTO 25Ø
29Ø IF B$="A" AND Y<4 THEN MID$(
A$(Y),X,2)=MID$(A$(Y+1),X,2): MI
D$(A$(Y+1),X,2)=C$: Y=Y+1: J=1
3ØØ IF B$="Z" AND Y>1 THEN MID$(
A$(Y),X,2)=MID$(A$(Y-1),X,2): MI
D$(A$(Y-1),X,2)=C$: Y=Y-1: J=1
31Ø IF B$="," AND X<1Ø THEN MID$
(A$(Y),X,2)=MID$(A$(Y),X+3,2): M
ID$(A$(Y),X+3,2)=C$: X=X+3: J=1
32Ø IF B$="." AND X>1 THEN MID$(
A$(Y),X,2)=MID$(A$(Y),X-3,2): MI
D$(A$(Y),X-3,2)=C$: X=X-3: J=1
33Ø PRINT @ Ø,"";: FOR Z=1 TO 4:
PRINT A$(Z): NEXT: RETURN
34Ø END
```

Program Listing 2. Bull's Eye

```
1ØØ REM * BULL'S EYE * TRS-8Ø EX
TENDED COLOR BASIC 16K/RAMELLA
11Ø POKE 65495,Ø: PCLEAR 2: PMOD
E 1,1: COLOR 3,Ø: PCLS 1: SCREEN
3,1: DIM M(31,31)
12Ø DIM K(6,5): FOR X=Ø TO 5: FO
R Y=Ø TO 4: IF X<1 OR Y<1 OR X>4
OR Y>3 THEN K(X,Y)=1
13Ø NEXT Y,X: FOR Z=26 TO 32 STE
P 6: CIRCLE(48,48),Z,4: NEXT: PA
INT(48,21),4,4
14Ø FOR Y=Ø TO 64 STEP 32: FOR X
=Ø TO 96 STEP 32
15Ø LINE(X,Y)-(X+32,Y+32),PSET,B
: LINE(X+1,Y+1)-(X+31,Y+31),PSET
,B: NEXT X,Y
16Ø PAINT(48,48),3,3: PAINT(125,
3),2,3: PAINT(125,92),2,3
17Ø COLOR 4,Ø: LINE(1Ø8,45)-(116
,5Ø),PSET,BF: A=2: B=2: X=33: Y=
X: Q=32: W=32
18Ø A$=INKEY$: IF A$<>"A" AND A$
<>"Z" AND A$<>"," AND A$<>"." OR
A$="A" AND K(A,B+1)=1 OR A$="Z"
AND K(A,B-1)=1 OR A$="," AND K(
A+1,B)=1 OR A$="." AND K(A-1,B)=
1THEN 18Ø
19Ø IF A$="," THEN U=X+32: S=-1:
GOSUB 26Ø: X=X+32: A=A+1
2ØØ IF A$="." THEN U=X-32: S=1:
GOSUB 26Ø: X=X-32: A=A-1
21Ø IF A$="A" THEN V=Y+32: S=-1:
GOSUB 27Ø: Y=Y+32: B=B+1
22Ø IF A$="Z" THEN V=Y-32: S=1:
GOSUB 27Ø: Y=Y-32: B=B-1
23Ø S$=S$+A$
24Ø IF PPOINT(48,48)=8 AND PPOIN
T(28,28)=8 AND PPOINT(48,23)=8 A
ND PPOINT(68,28)=8 AND PPOINT(74
,48)=8 AND PPOINT(68,68)=8 AND P
POINT(48,74)=8 AND PPOINT(28,68)
=8 AND PPOINT(23,48)=8 THEN SOUN
D RND(2ØØ),1: POKE 65494,Ø: GOTO
24Ø
25Ø GOTO 18Ø
26Ø V=Y: GET(U,V)-(U+Q,V+W),M,G:
FOR H=U TO X STEP S: PUT(H,V)-(
H+Q,V+W),M,PSET: NEXT H: RETURN
27Ø U=X: GET(U,V)-(U+Q,V+W),M,G:
FOR H=V TO Y STEP S: PUT(U,H)-(
U+Q,H+W),M,PSET: NEXT H: RETURN
28Ø END
29Ø REM * TYPE POKE 65494,Ø AND
PRESS ENTER AFTER USE
```

Program Listing 3. Consarnation

```
1ØØ REM * CONSARNATION - PUZZLE
CONTEST #2 *
11Ø REM * COLOR BASIC AND MC-1Ø
BASIC
12Ø CLEAR 5ØØ
13Ø P=1Ø24: ' FOR MC-1Ø MAKE IT:
P=16384
14Ø CLS: DIM A$(8): Q=7Ø: K=175:
M$="AZ,."
15Ø A$(Ø)="9 4 2 2 7 1 5 4 3 3 2
"
16Ø A$(1)="6   1   9   4   3   7
"
17Ø A$(2)="5 5 3 1 1 1 4 9 2 5 1
"
18Ø A$(3)="2   4   4   9   1   4
"
19Ø A$(4)="1 1 7 5 3 7 6 9 4 3 2
"
2ØØ A$(5)="6   1   4   3   8   2
"
21Ø A$(6)="1 6 8 2 9 3 4 6 3 8 9
"
22Ø FOR X=7Ø TO 288 STEP 32: PRI
NT @ X,A$(Z);: Z=Z+1: NEXT
23Ø FOR X=37 TO 59: IF X=37 OR X
=59 THEN FOR Z=X TO X+256 STEP 3
2: POKE P+Z,K: NEXT Z
24Ø POKE P+X,175: POKE P+X+256,K
: NEXT X
25Ø FOR X=1Ø4 TO 12Ø STEP 4: FOR
Z=X TO X+128 STEP 64: POKE P+Z,
K: NEXT Z,X
26Ø E=PEEK(Q+P): F=Q+P
27Ø Z$=INKEY$:IFZ$<>"A"ANDZ$<>"Z
"ANDZ$<>","ANDZ$<>"."THENPOKEQ+P
,255:FORT=1TO4Ø:NEXT:POKEQ+P,E:G
OTO27Ø
28Ø IF Z$="A" AND W$="Z" OR Z$="
Z" AND W$="A" OR Z$="," AND W$="
." OR Z$="." AND W$="," THEN 27Ø
29Ø IF KJ=1 THEN KJ=Ø: GOSUB 52Ø
: GOTO 27Ø
3ØØ W$=Z$: E=PEEK(Q+P): F=Q+P: G
OSUB 34Ø: N=N+1
31Ø IF N=5 THEN SC=SC+VAL(CHR$(E
-64)): N=Ø: POKE F,112: E=PEEK(F
): W$="": H=H+1
32Ø IF H=1Ø THEN 53Ø
33Ø PRINT @ Ø,"TURN"H":"SC: GOTO
27Ø
34Ø IF Z$<>"A" THEN 37Ø
35Ø IF PEEK(P+Q-32)<>K THEN Q=Q-
32: GOTO 46Ø
36Ø N=N-1: RETURN
37Ø IF Z$<>"Z" THEN 4ØØ
38Ø IF PEEK(P+Q+32)<>K THEN Q=Q+
32: GOTO 46Ø
39Ø N=N-1: RETURN
4ØØ IF Z$<>"," THEN 43Ø
41Ø IF PEEK(P+Q-2)<>K AND PEEK(P
+Q-1)<>K THEN Q=Q-2: GOTO 46Ø
42Ø N=N-1: RETURN
43Ø IF Z$<>"." THEN 46Ø
44Ø IF PEEK(P+Q+1)<>K AND Z$="."
AND PEEK(P+Q+2)<>K THEN Q=Q+2:
GOTO 46Ø
45Ø N=N-1: RETURN
46Ø IF Z$="A" THEN D$="N"
47Ø IF Z$="Z" THEN D$="S"
48Ø IF Z$="," THEN D$="W"
49Ø IF Z$="." THEN D$="E"
5ØØ S$=S$+D$: F=Q+P: E=PEEK(Q+P)
: GOSUB 52Ø: RETURN
51Ø E=PEEK(Q+P): F=Q+P: GOSUB 52
Ø
52Ø POKE Q+P,255: FOR T=1 TO 2Ø:
NEXT T: POKE Q+P,E: RETURN
53Ø PRINT @ Ø,"TURN"H"FINAL SCOR
E:";SC: S$=STR$(SC)+" "+S$
54Ø PRINT @ 32Ø,"ANSWER STRING:"
S$: END
```

Missile Defense

Program Listing 1. Defense 2

```
1Ø1Ø GOTO 29ØØ
1Ø2Ø '  DEFENSE   VERSION 2.Ø
1Ø3Ø 'D-M-D SOFTWARE ASSOCIATES
1Ø7Ø IF PEEK(&HCØØØ)=68 THENCLEA
R 1Ø24,&H7CFE: AD=&H7DØØ: LOADM
"BDEFENSE.BIN",&H4ØØØ ELSECLEAR1
Ø24,&H3CFE: AD=&H3DØØ: CLOADM"BD
EFENSE"
1Ø75 DEFUSRØ=AD: CS=USRØ(Ø)
1Ø9Ø SL$="*** ØØØØØ*** ØØØØØ***
ØØØØØ*** ØØØØØ*** ØØØØØ*** ØØØØØ
*** ØØØØØ*** ØØØØØ*** ØØØØØ*** Ø
ØØØØ"
11ØØ Q=VARPTR(SL$):Q=PEEK(Q+2)*2
56+PEEK(Q+3)
111Ø DIM P(2), C(1,5), P$(2), N$
(9), C$(2), A$(1,1), S(4)
112Ø 'DRAW $ FOR CITYS & DGTS
113Ø C$(Ø)="U4R2U4R2U14R6D4R2D12
R4D6L16"
114Ø C$(1)="U6R2U12R4D2R4U6R2D12
R2D4R2D6L16"
115Ø C$(2)="U8R2U4R2U8R2D4R4U6R4
D16R2D6L16"
116Ø N$(Ø)="BU2U6E2R4F2D6G2L4BR1
4"
117Ø N$(1)="BR2R4L2NU1ØBR1Ø"
118Ø N$(2)="BU8E2R4F2G2L2G4D2R8B
R6"
119Ø N$(3)="BU8E2R4F2G2NL2F2D2G2
L4NH2BR14"
12ØØ N$(4)="BU4NR8E6D1ØBR1Ø"
121Ø N$(5)="BU1ØNR8D4R6F2D2G2L4N
H2BR14"
122Ø N$(6)="BU1ØBR4NR4G4ND4R6F2D
2G2L4BR14"
123Ø N$(7)="BU1ØR8G6D4BR14"
124Ø N$(8)="BU2U2BU4E2R4F2G2NL4F
2D2G2L4BR16"
125Ø N$(9)="BU8E2R4F2D2NL6D4G2L4
NH2BR14"
126Ø 'CITY,LASER ORIGNS; MISSLE
Y-POS, BONUS SIZE, HI/SLO POKES
127Ø C(Ø,Ø)=1Ø: C(Ø,1)=46: C(Ø,2
)=82: C(Ø,3)=154: C(Ø,4)=19Ø: C(
Ø,5)=226
128Ø P(Ø)=1Ø: P(1)=5: P(2)=2: PN
=65494: PF=PN'+1
13ØØ 'PLAY $
131Ø PØ$="V31L1ØØO4CDEDEFEFGFGAG
ABABO+C"
132Ø P1$="V31L69O1C#CC#CC#CC#CC#
CC#CC#CC#CC#CC#CC#C": P2$="V3
1L1ØØO4A": P3$="V2ØL25ØO1FAFA":
P4$="L15ØO1FA": P5$="V5L15ØO4E"
133Ø P$(1)="T2V31L33O3BEBEBEBEBE
BEBEBE": P$(2)="T2V31L1ØØO3ABCDE
FGABCDEGFABCDEFGABCDEFGABCDEFGAB
CDEFGAB"
134Ø A$="GECECO-GO+CO-GE": P$(Ø)
="V31L5ØO5"+A$+A$+A$
135Ø 'MAIN PROGRAM
136Ø 'INSTRUCTIONS & LEVEL
137Ø POKE PN,Ø: CLS: FOR T=487 T
O 231 STEP -32: PRINT @T,"D E F
E N S E   II";: PLAY "V1ØL24O5G"
: FOR U=Ø TO 63: NEXT U: IF T>23
1 THEN PRINT @T,"
   ";: NEXT T
138Ø PLAY P1$:POKE PF,Ø:PRINT: P
RINT@262,"INSTRUCTIONS (Y/N)?"
139Ø A$=INKEY$: IF A$="Y" THEN 2
79Ø ELSE IF A$="" THEN 139Ø
14ØØ POKE PF,Ø: CLS: PMODE 1,1:
PCLS
141Ø PRINT@35,"CHOOSE SKILL LEVE
L (1-5):"
142Ø L=ASC(INKEY$+" ")-48: IF L<
1 OR L>5 THEN 142Ø
143Ø 'CITYS, SCOR, HIT VAL, BONU
S CITYS, BONUS THRESHOLD, SCORE
COUNT, MISL X-POS & ANGL, SCREEN
 MODE, COLRST OFST
144Ø FOR T=Ø TO 5: GOSUB 186Ø: N
EXT T: GOSUB 189Ø
145Ø S(Ø)=Ø: S(1)=Ø: S(2)=Ø: S(3
)=Ø: S(4)=Ø: VA=1Ø: CØ=Ø: C1=Ø:
CC=3: SC=1: CT=6
146Ø FOR T=Ø TO 2: GOSUB 183Ø: N
EXT T: MD=1: CM=4: SCREEN 1,MD
147Ø 'SHOW LVL, SCOR, BNS CTYS
148Ø LINE (Ø,Ø)-(254,1Ø),PRESET,
BF: DRAW "C3BM92,1Ø"+N$(S(4))+N$
(S(3))+N$(S(2))+N$(S(1))+N$(S(Ø)
)
149Ø DRAW "BM5,1Ø"+N$(L)+"BM228,
1Ø"+N$(C1)+N$(CØ)+"C4"
15ØØ 'TOP OF MISSILE LOOP
151Ø IF INKEY$="Q" THEN 244Ø ELS
E IF RND(5Ø)+RND(5Ø)=2Ø THEN 2Ø8
Ø
154Ø MS=USR4(Ø): IF MS THEN161Ø
155Ø IF USR1(L) THEN 151Ø
156Ø SS=USR3(Ø): IF SS THEN 158Ø
 ELSE IF VA THEN VA=VA-2
157Ø GOTO151Ø
158Ø T=(SS AND 3)-1: GOSUB 183Ø:
 IF T+1=SS THEN SC=P(T): PLAY P$
(T)
159Ø GOTO 196Ø
16ØØ 'MSL HIT CTY, GND, OR UNDR
161Ø FOR T=2 TO Ø STEP -1: IF (M
S AND 1) THEN GOSUB 183Ø
162Ø MS=MS*.5: NEXT T: FOR T=Ø T
O 5
163Ø IF C(1,T)=PEEK(CS+T) THEN 1
69Ø ELSE ON C(1,T) GOTO 244Ø,167
Ø
164Ø PLAY "V1": FOR U=Ø TO 16 ST
EP 2: CIRCLE (C(Ø,T)+8,182),U,4,
2,.5,Ø: PLAY "V+V+V+"+P4$: NEXT
U
165Ø FOR U=16 TO Ø STEP -2: CIRC
LE (C(Ø,T)+8,182),U,1,2,.5,Ø: PL
AY "V-V-V-"+P4$: NEXT U
166Ø LINE (C(Ø,T)-8,16Ø)-(C(Ø,T)
+24,182),PRESET,BF: C(1,T)=2: CT
=CT-1: GOTO 163Ø
167Ø PLAY "V31": FOR U=Ø TO 16 S
TEP 2: CIRCLE (C(Ø,T)+8,187),U,4
,.5
168Ø PLAY P4$+"V-V-V-": CIRCLE (
C(Ø,T)+8,187),U,1,.5: NEXT U: C(
1,T)=1: GOTO 163Ø
169Ø NEXT T: GOTO 2Ø4Ø
17ØØ '***SUBROUTINES***
18ØØ '*CLEAR STREAMER
181Ø A=USR5(T)
182Ø '*GET NEW MISSL X-POS/ANGL
183Ø A=RND(7)-1: B=RND(7)-1: IF
B=3 OR ABS(A-B)>2 THEN 183Ø
184Ø A=USRØ((B-A+2)*256+A*4+T):
RETURN
185Ø '*DRAW GRND & RANDOM CITY
186Ø C(1,T)=3: POKE CS+T,3: COLO
R 2,1: LINE (C(Ø,T)-1Ø,184)-(C(Ø
,T)+24,19Ø),PSET,BF
187Ø DRAW "C4BM"+STR$(C(Ø,T))+",
182"+C$(RND(3)-1): PAINT (C(Ø,T)
+6,18Ø),4: CT=CT+1: RETURN
188Ø '*DRAW FORTRESS & GROUND
189Ø DRAW "C3BM124,156R2D26NL6NR
8R2U26R2C2": LINE(1Ø2,184)-(152,
19Ø),PSET,BF: COLOR 4,1: RETURN
195Ø 'SCORE ROUTINE
196Ø A=VA*SC*L: VA=1Ø: SC=1:T=Ø
197Ø S(T)=S(T)+A: IF S(T)>9 THEN
 A=INT(S(T)*.1): S(T)=S(T)-A*1Ø:
 T=T+1: GOTO 197Ø
199Ø IF S(3)+S(4)*1Ø<CC THEN 2Ø2
Ø ELSE CC=CC+3: CØ=CØ+1: PLAY "T
2O5V24L8ØAP3Ø": IF CØ=1Ø THEN CØ
=Ø: C1=C1+1
2ØØØ GOTO 199Ø
2Ø1Ø ' CHECK LEVEL AGNST SCOR
2Ø2Ø IF L*5-1<S(3)+S(4)*1Ø AND L
<5 THEN L=L+1
2Ø3Ø 'CHECK IF NEW CTY NEEDD
2Ø4Ø FOR T=Ø TO 5: IF CØ=Ø AND C
1=Ø THEN 2Ø55 ELSE IF C(1,T)<3 T
HEN PLAY PØ$: GOSUB 186Ø: CØ=CØ-
1: IF CØ<Ø THEN CØ=9: C1=C1-1
2Ø5Ø NEXT T
2Ø55 IF CT=Ø THEN 244Ø ELSE148Ø
2Ø6Ø 'START OF ALIEN ROUTINE
2Ø7Ø 'CLR STRMRS, CHNG SCRN MODE
, GET ALIEN ATTK X-STRT & ANGL
2Ø8Ø FOR T=Ø TO 2: GOSUB 181Ø: N
EXT T: MD=1-MD: CM=MD*4: SCREEN
1,MD: R=Ø
2Ø9Ø A=RND(1ØØ)*2+26: B=32: C=(1
26-A)*L/126
21ØØ 'SELECT ALIEN
211Ø ON RND(5) GOSUB 229Ø,232Ø,2
35Ø,238Ø,241Ø
212Ø 'TOP OF ALIEN LOOP
213Ø 'INCR ALIEN POS, DRAW CURSO
R & ALIEN, CHECK IF AT FORTRESS
214Ø A=A+C: B=B+L: R=1-R: IF R T
HEN PLAY P2$
215Ø DRAW "C2BM"+STR$(INT(A))+",
"+STR$(B)+A$(R,Ø)+"C4"+A$(R,1)
216Ø IF B>156 THEN 225Ø
217Ø IF USR2(L) THEN 223Ø
219Ø GOSUB 221Ø: GOTO 214Ø
22ØØ '*CLEAR ALIEN
221Ø DRAW"C1BM"+STR$(INT(A))+","
+STR$(B)+A$(R,Ø)+A$(R,1):RETURN
222Ø 'ALIEN HIT
223Ø GOSUB 221Ø: POKE PN,Ø: PLAY
 P1$: POKE PF,Ø: GOSUB 189Ø: VA=
2Ø: SC=1Ø: GOTO 196Ø
224Ø 'ALIEN ATTKD FRTRSS: CHECK
NMBR OF BONUS CITYS
225Ø IF C1=Ø AND CØ<L THEN 244Ø
ELSE GOSUB 221Ø: PLAY "V24O3L9T3
FCV<FCV<FCV<FCV<FCT2": GOSUB 189
Ø: CØ=CØ-L: IF CØ<Ø THEN CØ=CØ+1
Ø: C1=C1-1
226Ø GOTO 148Ø
227Ø 'ALIEN $
228Ø 'PAC-MAN
229Ø A$(Ø,Ø)="R2E2L4U2R6U2L6U2R8
U2L8U2R6U2L6U2R4H2L4ND1ØG2D14H2U
6NU4NL2NG2": A$(Ø,1)="BR8U2"
23ØØ A$(1,Ø)="BD8U2R2E2L6U2R16D2
L6F2R2ND2U6L12U2R12H2L8E2R4": A$
(1,1)="BD6U2": RETURN
231Ø 'STARSHIP
232Ø A$(Ø,Ø)="BD4U2NL2NR2U16F2ND
8BL4ND8BD6L4NU4ND2R12ND2NU4": A$
(Ø,1)="BL6U2"
233Ø A$(1,Ø)="U2NL2NR2U16F2ND8BL
4ND8G2L2NU4ND2R12ND2NU4": A$(1,1
)="BD2BL6D2": RETURN
234Ø 'FLYING SAUCER
235Ø A$(Ø,Ø)="U4NL4NR4U2NL8NR8U2
NL8NR8U2NL4NR4":A$(Ø,1)="BU2U2"
236Ø A$(1,Ø)=A$(Ø,Ø)+"U4": A$(1,
1)="BD12D2": RETURN
237Ø 'POD
238Ø A$(Ø,Ø)="NL2E2NL6E2NL1ØU2NL
1ØH2NL6H2NE4L2NH4BD1ØBL4G6F6BR1Ø
E6H12": A$(Ø,1)="BD2R2"
239Ø A$(1,Ø)="BL6NL2E2NL6E2NL1ØU
2NL1ØH2NL6H2NL2E2R2BL8L2BD12L4D8
BR18U8L4H6":A$(1,1)="R2":RETURN
24ØØ 'ROBOT
241Ø A$(Ø,Ø)="U1ØG2ND14D4NL6NR1Ø
BE4ND14D2": A$(Ø,1)="L2"
242Ø A$(1,Ø)="U1ØG2D1ØNG4BR4NF4U
1ØBR4D4L12U4BR4BD2": A$(1,1)="R2
": RETURN
243Ø 'TOP TEN SCORE ROUTINE
244Ø POKE PN,Ø: FS=S(Ø)+S(1)*1Ø+
S(2)*1ØØ+S(3)*1E3+S(4)*1E4: FS$=
STR$(FS): FS$=LEFT$("*** ØØØØØ",
1Ø-LEN(FS$))+MID$(FS$,2)
245Ø 'LOOP-FIND POS IN TOP TEN
246Ø FOR T=9Ø TO 9 STEP-9: IF VA
L(MID$(SL$,T-4,5))>=FS THEN 247Ø
 ELSE NEXT T: SL$=FS$+LEFT$(SL$,
81): GOTO 248Ø
247Ø IF T=9Ø THEN GOSUB 259Ø: GO
TO 256Ø ELSE SL$=LEFT$(LEFT$(SL$
,T)+FS$+MID$(SL$,T+1),9Ø)
248Ø GOSUB 259Ø: PRINT: PRINT" Y
```

```
OU'VE SCORED IN THE TOP TEN!"
249Ø PRINT"  PLEASE ENTER YOUR I
NITIALS."
25ØØ 'GET INITS, ADD TO LIST
251Ø U=T/9: PRINT @73+U*32,">";:
 A=Ø: B=Ø: FOR V=Ø TO 2
252Ø FS$=INKEY$: IF FS$<CHR$(32)
 THEN B=B+1: IF B=24 THEN B=Ø: P
OKE 11Ø1+U*32+V,42+A: A=64-A: GO
TO 252Ø ELSE 252Ø
253Ø PRINT @77+32*U+V,FS$;: MID$
(SL$,T+1+V,1)=FS$: NEXT V: GOSUB
 259Ø
254Ø 'POKE LINE 1Ø9Ø W/ UPDATED
SCORE LIST
255Ø FOR T=Ø TO 89: POKE T+Q,ASC
(MID$(SL$,T+1,1)): NEXT T
256Ø PRINT@419,"HIT ENTER TO PLA
Y NEW GAME      HIT <Q> TO QUIT T
HIS PROGRAM";
257Ø FS$=INKEY$: IF FS$=CHR$(13)
 THEN 14ØØ ELSE IF FS$="Q" THEN
262Ø ELSE 257Ø
258Ø '*DISPLAY TOP 1Ø LIST
259Ø CLS: PRINT"          TOP TEN
 SCORES": PRINT
26ØØ FOR U=1 TO 1Ø: PRINT USING
"          ## %          %";U,MID$(
SL$,U*9-8,9): NEXT U: RETURN
262Ø CLS: PRINT"TO SAVE THE TOP
TEN SCORES JUST SAVE DEFENSE II
OVER ITSELF."
2625 '**OPTIONAL LINE FOR DISK
USERS TO AUTO-SAVE TOP TEN LIST
263Ø 'IF PEEK(&HCØØØ)=68 THEN SA
VE"DEFENSE2"
277Ø END
278Ø 'INSTRUCTIONS
279Ø CLS: PRINT "THE OBJECT OF T
HIS GAME IS TO   DEFEND YOUR SIX
 CITIES FROM     MISSILES, AND Y
OUR FORTRESS FROMALIENS.  TO DO
THIS YOU MUST    POSITION YOUR S
IGHT ON A MISSILEOR THE DARKENED
 PORTION OF AN   ALIEN AND FIRE
YOUR LASER."
28ØØ PRINT: PRINT "THIS GAME CON
SISTS OF FIVE SKILLLEVELS WITH I
NCREASING MISSILE  AND ALIEN SPE
EDS AS THE LEVEL   INCREASES. TH
E FINAL VALUE OF A SCORE ON A MI
SSILE IS DETERMINEDBY THREE FACT
ORS:"
281Ø GOSUB 288Ø: PRINT "FIRST, T
HE BASE VALUE OF THE    SHOT IS
SET AT 1Ø.  EVERY SHOT   MISSED D
ECREASES THIS VALUE BY   2 TO A M
INIMUM OF Ø.  WHEN A     SHOT SCO
RES THE BASE VALUE IS    MULTIPLI
ED BY THE SKILL LEVEL.   A 'DEAD
CENTER' HIT WILL";
282Ø PRINT " AWARD ABONUS MULTIP
LIER OF 2,5, OR 1Ø  DEPENDING ON
 COLOR. THE BASE    VALUE IS RES
ET TO 1Ø EACH TIME ASHOT SCORES.
"
283Ø PRINT: PRINT "A BONUS CITY
IS ASSIGNED EVERY  3ØØØ POINTS.
 SKILL LEVEL       INCREASES EAC
H 5ØØØ POINTS."
284Ø GOSUB 288Ø: PRINT "A SUCCES
SFUL ATTACK BY AN ALIEN WILL COS
T 1-5 BONUS CITIES      DEPENDIN
G ON YOUR LEVEL."
285Ø PRINT: PRINT "YOU LOSE WHEN
 ALL OF YOUR CITIESARE GONE, WHE
N AN ALIEN ATTACKS YOUR FORTRESS
 AND YOU HAVE TOO  FEW BONUS CIT
IES, OR WHEN A     MISSILE PENET
RATES THE          UNDERGROUND.
"
286Ø GOSUB 288Ø: PRINT "THE TOP
OF THE SCREEN DISPLAYS  FROM LEF
T TO RIGHT:  LEVEL,     SCORE, A
ND BONUS CITIES.        AT THE E
ND OF THE GAME A 'TOP   TEN' ROU
TINE WILL ALLOW FOR     SAVING T
HE TOP TEN SCORES ON    DISK."
287Ø GOSUB 288Ø: GOTO 14ØØ
288Ø PRINT@481,">> TYPE ANY KEY
TO CONTINUE <<";
289Ø IF INKEY$="" THEN 289Ø ELSE
 CLS: RETURN
29ØØ PCLEAR 2: GOTO 1Ø2Ø
```

Program Listing 2. Basic Loader

```
1Ø '*** BDEFENSE MACHINE CODE
2Ø '***          LOADER
3Ø '*** (C) 1984 BY D-M-D
4Ø '*** SOFTWARE ASSOCIATES
5Ø '****************************
55 CLS: PRINT"MACHINE CODE LOADI
NG..."
6Ø STARTADDRESS=&H3DØØ
7Ø AD=ST
8Ø READ CODE
9Ø IF CODE=999 THEN PRINT"MACHIN
E CODE IS NOW IN MEMORY": GOTO 5
ØØ
1ØØ POKE AD,CODE
11Ø AD=AD+1: GOTO 8Ø
5ØØ IF PEEK(&HCØØØ)=68 THEN SAVE
M"BDEFENSE.BIN",&H3DØØ,&H3FDB,&H
3DØØ: PRINT"BDEFENSE IS NOW STOR
ED ON DISK": END
51Ø PRINT"TO SAVE BDEFENSE ON TA
PE TYPE:"
52Ø PRINT"CSAVEM"CHR$(34)"BDEFEN
SE"CHR$(34)",&H3DØØ,&H3FDB,&H3DØ
Ø
1ØØØ '
1Ø1Ø DATA 52, 64, 158, 176, 51,
141, Ø, 213, 239, 129
1Ø2Ø DATA 51, 14Ø, 77, 239, 129,
 51, 14Ø, 4Ø, 239, 129
1Ø3Ø DATA 51, 141, 2, 1ØØ, 239,
129, 51, 141, 1, 44
1Ø4Ø DATA 239, 129, 51, 141, 2,
154, 239, 132, 222, 186
1Ø5Ø DATA 51, 2Ø1, 12, Ø, 255, 6
2, 149, 53, 64, 48
1Ø6Ø DATA 141, 1, 15, 31, 16, 12
6, 18Ø, 244, 141, 34
1Ø7Ø DATA 9Ø, 39, 248, 166, 14Ø,
 38, 68, 2Ø4, 2, 128
1Ø8Ø DATA 37, 3, 2Ø4, 4Ø, Ø, 164
, 136, 224, 228, 136
1Ø9Ø DATA 225, 237, 227, 23, 1,
159, 236, 225, 32, 221
11ØØ DATA 141, 2, 32, 217, 189,
179, 237, 192, 6, 231
111Ø DATA 14Ø, 112, 2Ø4, Ø, Ø, 3
9, 2Ø, 158, 186, 68
112Ø DATA 86, 48, 139, 2Ø4, 24Ø,
 15, 37, 3, 2Ø4, Ø
113Ø DATA 255, 164, 132, 228, 1,
 237, 132, 182, 255, 35
114Ø DATA 132, 247, 183, 255, 35
, 182, 255, 32, 167, 14Ø
115Ø DATA 5, 173, 159, 16Ø, 1Ø,
134, Ø, 183, 255, 32
116Ø DATA 182, 255, 35, 138, 8,
183, 255, 35, 252, 1
117Ø DATA 9Ø, 3Ø, 137, 139, 14,
88, 88, 237, 141, 1
118Ø DATA 92, 68, 86, 68, 86, 23
7, 14Ø, 181, 158, 186
119Ø DATA 68, 86, 48, 139, 2Ø4,
15, 24Ø, 37, 3, 2Ø4
12ØØ DATA 255, Ø, 17Ø, 132, 234,
 1, 237, 132, 1Ø8, 14Ø
121Ø DATA 13, 39, 1Ø, 2Ø4, 14, 1
28, 131, Ø, 1, 38
122Ø DATA 251, 32, 145, 134, Ø,
246, 255, Ø, 196, 1
123Ø DATA 57, 189, 179, 237, 231
, 14Ø, 24, 128, 2, 167
124Ø DATA 14Ø, 29, 237, 14Ø, 33,
 196, 3, 134, 13, 61
125Ø DATA 48, 14Ø, 42, 48, 133,
167, 1Ø, 76, 167, 1
126Ø DATA 2Ø4, Ø, 9, 132, 6Ø, 61
, 2Ø3, 18, 231, 2
127Ø DATA 2Ø4, Ø, Ø, 71, 86, 237
, 6, 2Ø4, Ø, Ø
128Ø DATA 84, 84, 231, 14Ø, 1, 1
39, Ø, 129, 3, 37
129Ø DATA 1, 74, 167, 12, 57, 85
, Ø, Ø, Ø, 12
13ØØ DATA Ø, Ø, Ø, 1, Ø, Ø, Ø, Ø
, 17Ø, Ø
131Ø DATA Ø, Ø, 12, Ø, Ø, Ø, 1,
Ø, Ø, Ø
132Ø DATA Ø, 255, Ø, Ø, Ø, 12, Ø
, Ø, Ø, 1
133Ø DATA Ø, Ø, Ø, Ø, 3, 3, 3, 3
, 3, 3
134Ø DATA 52, 96, 49, 141, Ø, 14
7, 51, 14Ø, 2Ø2, 111
135Ø DATA 14Ø, 56, 1Ø4, 14Ø, 53,
 1Ø8, 65, 141, 58, 167
136Ø DATA 75, 236, 141, Ø, 11Ø,
163, 7Ø, 167, 74, 23Ø
137Ø DATA 65, 193, 8Ø, 37, 25, 4
8, 14Ø, 212, 166, 76
138Ø DATA 48, 134, 166, 132, 129
, 2, 36, 4, 193, 88
139Ø DATA 38, 8, 1Ø6, 132, 1Ø8,
14Ø, 11, 79, 141, 19
14ØØ DATA 166, 196, 51, 77, 76,
38, 2Ø1, 198, Ø, 53
141Ø DATA 96, 126, 18Ø, 244, Ø,
Ø, Ø, 236, 196, 167
142Ø DATA 14Ø, 42, 231, 14Ø, 245
, 236, 66, 237, 14Ø, 45
143Ø DATA 236, 68, 237, 14Ø, 48,
 23Ø, 14Ø, 37, 68, 86
144Ø DATA 68, 86, 68, 86, 158, 1
86, 48, 139, 23Ø, 14Ø
145Ø DATA 24, 196, 6, 166, 165,
164, 132, 167, 14Ø, 6
146Ø DATA 92, 166, 165, 132, Ø,
138, Ø, 188, 62, 149
147Ø DATA 36, 2, 167, 132, 2Ø4,
Ø, Ø, 227, 7Ø, 237
148Ø DATA 14Ø, 249, 2Ø4, Ø, Ø, 2
27, 72, 1Ø6, 14Ø, 18Ø
149Ø DATA 38, 196, 57, 63, 192,
2Ø7, 48, 243, 12, 252
15ØØ DATA 3, 255, Ø, 128, Ø, 77,
 Ø, Ø, Ø, Ø
151Ø DATA Ø, 52, 96, 49, 14Ø, 23
3, 51, 14Ø, 238, 48
152Ø DATA 72, 2Ø4, 1, Ø, 237, 13
2, 237, 3Ø, 2Ø4, Ø
153Ø DATA Ø, 128, 77, 37, 6, 38,
 7, 167, 132, 32
154Ø DATA 3, 64, 96, 132, 192, 1
26, 37, 6, 38, 7
155Ø DATA 231, 3Ø, 32, 3, 8Ø, 96
, 3Ø, 231, 65, 231
156Ø DATA 14Ø, 1, 129, Ø, 39, 48
, 37, 6, 48, 3Ø
157Ø DATA 167, 65, 3Ø, 137, 77,
39, 37, 231, 14Ø, 13
158Ø DATA 231, 14Ø, 14, 198, 128
, 231, 14Ø, 11, 95, 72
159Ø DATA 37, 4, 129, Ø, 37, 4,
128, Ø, 2Ø3, Ø
16ØØ DATA 1ØØ, 14Ø, 252, 36, 24Ø
, 166, 132, 74, 39, 2
161Ø DATA 76, 8Ø, 237, 132, 1Ø8,
 65, 23, 255, 54, 142
162Ø DATA 162, Ø, 232, 128, 2Ø2,
 2, 247, 255, 32, 134
163Ø DATA 128, 74, 38, 253, 14Ø,
 162, 32, 38, 239, 23Ø
164Ø DATA 65, 23, 255, 31, 53, 2
24, 23, 255, 118, 48
165Ø DATA 141, 254, 154, 79, 76,
 167, 14Ø, 37, 236, 1Ø
166Ø DATA 224, 141, 255, 121, 37
, 32, 192, 1, 34, 28
167Ø DATA 231, 14Ø, 14, 16Ø, 141
, 255, 1Ø9, 37, 19, 129
168Ø DATA 6, 34, 15, 68, 74, 71,
 138, Ø, 167, 14Ø
169Ø DATA 3, 141, 31, 2Ø4, Ø, Ø,
```

Listing continued

```
 32, 11, 48, 13
17ØØ DATA 166, 14Ø, 248, 129, 3,
 38, 2Ø3, 79, 95, 126
171Ø DATA 18Ø, 244, 189, 179, 23
7, 134, 13, 61, 48, 141
172Ø DATA 254, 85, 48, 133, 52,
96, 49, 141, 255, 19
173Ø DATA 51, 132, 79, 23Ø, 65,
23, 254, 193, 111, 74
174Ø DATA 53, 224, 999
```

Pie in the Sky

```
1Ø CC=Ø
2Ø POKE65495,Ø
6Ø CLEAR6ØØ
65 FORX=1TO15:BS$=BS$+CHR$(8):NE
XTX
7Ø PMODE4,1
8Ø DIMD(23),A$(1Ø),S$(23),S(23),
P(23),L$(64):GOSUB1ØØØ
9Ø GOTO78Ø
19Ø CLS
2ØØ PRINT"NUMBER OF SECTORS (1-2
2)";:INPUT S:IF S>22 THEN 2ØØ
2Ø1 S$(Ø)="SEC/SUBJECT###   AMOU
NT"
2Ø2 PRINTS$(Ø)
21Ø FORX=1TOS
22Ø PRINT" "+CHR$(X+64)+". ";:LI
NE INPUT S$(X)
23Ø PRINTBS$;:INPUTS(X)
24Ø NEXTX
271 PRINT"input SUBJECT FOR THE
GRAPH":LINEINPUTSB$
272 IFS<21THENPRINT"INPUT A NOTE
 OR PRESS ENTER":LINEINPUTNT$
28Ø IF S=Ø THEN RUN ELSE PCLS1:S
CREEN1,SC:GP=1:COLOR2,1
281 IF S>2Ø THEN NT$=""
29Ø CIRCLE(2ØØ,7Ø),4Ø:CIRCLE(236
,128),14
295 C=Ø
3ØØ FORX=1TOS:C=C+S(X):NEXTX
31Ø FORX=1TOS
32Ø P(X)=S(X)*1ØØ/C:D(X)=P(X)
33Ø NEXTX:C=Ø
331 FORX=1TOS:A=1Ø-LEN(S$(X)):IF
A<ØTHENS$(X)=LEFT$(S$(X),1Ø):A=Ø
332 S$(X)=S$(X)+STRING$(A,32):NE
XTX
34Ø FORX=1TOS
35Ø C=C+P(X)
36Ø P(X)=C:NEXTX
37Ø PI=ATN(1)*4
38Ø FORX=1TOS
39Ø T=P(X)-5Ø
4ØØ A=(2*PI)*T/1ØØ
41Ø LINE(2ØØ,7Ø)-(4Ø*SIN(A)+2ØØ,
4Ø*COS(A)+7Ø),PSET:LINE(236,128)
-(12*SIN(A)+236,12*COS(A)+128),P
SET
411 T=(P(X)-(D(X)/2))-5Ø
412 IFD(X)>8THENK=28ELSEK=46
413 A=(2*PI)*T/1ØØ
414 DRAW"BM"+STR$(INT(K*SIN(A)+1
99))+","+STR$(INT(K*COS(A)+68))+
"C"+STR$(F)+L$(X+64-32)
42Ø NEXTX
421 X=LEN(SB$)*8:X=255-X
422 IFX<ØTHENX=Ø
43Ø DRAW"BM"+STR$(INT(X/2))+",Ø;
C2"
435 IFSB$=""THEN475
441 FORX=1TOLEN(SB$)
45Ø DRAWL$(ASC(MID$(SB$,X,1))-32
)
46Ø DRAW"BR4BU7"
47Ø NEXTX
475 IFS<16THENCD=4ØELSECD=14
48Ø DRAW"BMØ,"+STR$(CD)+";C2"
49Ø FORX=1TOS
5ØØ DRAWL$(X+64-32)+"BR4R1BR8BU7
"
5Ø5 IFS$(X)=""THEN56Ø
51Ø FORA=1TOLEN(S$(X))
53Ø DRAWL$(ASC(MID$(S$(X),A,1))-
32)
54Ø DRAW"BR4BU7"
55Ø NEXTA:IFLEN(STR$(INT(D(X))))
=2THENDRAW"BD7BR4BU7BR4"+L$(ASC(
"Ø")-32)+"BU7BL4":CL=1:IFLEN(STR
$(INT(D(X))))=2ANDINT(D(X))=ØTHE
NDRAW"BD7BR4BU7BR4"+L$(ASC("Ø")-
32)+"BU7BL4":CL=2
551 D=D(X)*1ØØ:D=INT(D):D=D/1ØØ:
L$=STR$(D):FORC=1TO6-CL:A$=MID$(
L$,C,1):IFA$=""ANDFF=ØTHENA$=CHR
$(64+32):FF=-1ELSEIFA$=""THENA$=
"Ø"
552 IFA$="."THENA$=CHR$(64+32):D
RAWL$(ASC(A$)-32)+"BR4BU7"ELSEDR
AWL$(ASC(A$)-32)+"BR4BU7"
553 NEXTC:DRAWL$(ASC("%")-32):FF
=Ø:CL=Ø
569 DRAW"BMØ,"+STR$(CD+X*8)
57Ø NEXTX:L=CD+X*8:IFL<155THENL=
155
571 IFNT$=""THEN58Ø
572 X=LEN(NT$)*8:X=255-X:IFX<ØTH
ENX=Ø:DRAW"BM"+STR$(INT(X/2))+",
"+STR$(L)ELSEDRAW"BM"+STR$(INT(X
/2))+","+STR$(L)
573 FORX=1TOLEN(NT$)
574 DRAWL$(ASC(MID$(NT$,X,1))-32
)
575 DRAW"BR4BU7":NEXTX
58Ø A$=INKEY$
59Ø A$=INKEY$:IF A$=""THEN59ØELS
E78Ø
78Ø POKE65495,Ø:CLS:PRINT"%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
PEICES OF PIE                %%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%"
79Ø CC=-1:PRINT"CHOOSE ONE:  1.C
REATE A FILE                 2.S
AVE TO TAPE                  3.L
OAD FROM TAPE                4.E
DIT SECTORS                  5.C
HANGE SUBJECT                6.C
HANGE NOTE **                7.E
XAMINE GRAPH"
795 INPUTA
81Ø ON A GOTO19Ø,82Ø,86Ø,2ØØØ,3Ø
ØØ,4ØØØ,28Ø
82Ø IF S=Ø THEN RUN ELSE POKE654
94,Ø:CLS:PRINT"**********************
***************          SAVE TO
TAPE"
83Ø PRINT:PRINT"INPUT AN EIGHT L
ETTER NAME FOR  YOUR GRAPH  '123
45678'                       ";:
LINEINPUTA$
84Ø OPEN"O",#-1,A$:PRINT"SAVING
"A$
85Ø PRINT#-1,S:FORX=1TOS:PRINT#-
1,S$(X),S(X):NEXTX:PRINT#-1,SB$,
NT$:CLOSE#-1:GOTO78Ø
86Ø POKE65494,Ø:CLS:PRINT"******
**************************
   LOAD FROM TAPE"
87Ø PRINT:PRINT"WHAT IS THE NAME
 OF THE FILE":LINEINPUT A$
88Ø OPEN"I",#-1,A$:PRINT"LOADING
 "A$
89Ø INPUT#-1,S
9ØØ FORX=1TOS:INPUT#-1,S$(X),S(X
):NEXTX:INPUT#-1,SB$,NT$:CLOSE#-
1:GOTO78Ø
91Ø INPUT#-1,S$(X),S(X)
92Ø X=X+1:GOTO9ØØ
93Ø S=X-2:SB$=S$(X-1):NT$=S$(X)
94Ø CLOSE#-1:GOTO78Ø
1ØØØ FOR X=65-32 TO 96-32:READ L
$(X):NEXT X
1Ø1Ø DATA BD2D4U4R1U1R1U1D1R1D1R
1D2NL4D2BD1
1Ø3Ø DATA R3D1R1D1L1D1L3NU3D3R3U
1R1U1BD3
1Ø5Ø DATA BD1R1L1R1U1R2D1R1BD4L1
R1L1D1L2U1L1U4BR4BD6
1Ø7Ø DATA  R3D1R1D4L1D1L3U6BD7BR
4
1Ø9Ø DATA NR4D3NR2D3R4BD1
111Ø DATA NR4D3NR2D3BR4BD1
113Ø DATA BD1R1L1R1U1R2D1R1BD3L2
R2D1L1D1L2U1L1U4BD6BR4
115Ø DATA D3R4NU3D3BL4U3BD4BR4
117Ø DATA BR2L1R1L2R1D6L1R2BR1BD
1BR1
119Ø DATA BR3L1R1L2R1D6L1U1L1BD2
BR4
121Ø DATA D6U3R1U1R1U1R1U1R1BD3B
L3D1R1D1R1D1R1BD1
123Ø DATA D6R4BD1
125Ø DATA ND6D1R1D1R1D1U1R1U1R1U
1D6BD1
127Ø DATA ND6D1R1D1R1D2R1D1R1U5D
6BD1
129Ø DATA BD1R1U1R2D1R1D4L1D1L2U
1L1U4BD6BR4
131Ø DATA ND6R3D1R1D1L1D1L3BD4BR
4
133Ø DATA BD1R1U1R2D1R1D4L1D1L2U
1L1U4BD4BR1D1U1D1R1D1R1BR1
135Ø DATA ND6R3D1R1D1L1D1L2R1D1R
1D1R1D1L1BR1BD1
137Ø DATA BR4BD1L1R1L1U1L2D1L1D1
R1D1R2D1R1D1L1D1L2U1L1BD2BR4
139Ø DATA R4L2D6BD1BR2
141Ø DATA D5R1D1R2U1R1U5BD7
143Ø DATA D4R1D1R1D1U1R1U1R1U4BD
7
145Ø DATA D6U1R1U1R1U1D1R1D1R1D1
NU6BD1
147Ø DATA D1R1D1R2U1R1U1BL2BD3L1
D2L1D1BR2BU3R1D2R1D1BD1
149Ø DATA D1R1D1R2U1R1U1BL2BD3D3
BR2BD1
151Ø DATA R4D1L1D1L1D1L1D1L1D2R4
BD1
1511 DATA NR3D6R3BR1BD1
1512 DATA D1R1D1R1D2R1D1R1D1BD1
1513 DATA BR1R3D6L3BR3BD1
1514 DATA BR2D6U6D1L1D1L1R3U1D1R
1BD5
1515 DATA BD3R4L4R1U1D2R1D1U4BR2
BD6
1516 DATA BD6BL2R1BD1BL1
152Ø FOR X=48-32 TO 57-32:READ L
$(X):NEXT X
153Ø DATA BD1D4R1D1R2U1R1U4L1U1L
2D2R1D2R1D2BR1BD1
154Ø DATA BD1BR1R1L1R1U1D6L2R4BD
1
155Ø DATA BD1R1L1R1U1R2D1R1D1L1D
1L2D1L1D2R4BD1
156Ø DATA BD1R1L1R1U1R2D1R1D1L1D
1L2R2D1R1D1L1D1L3BR4BD1
157Ø DATA BR2R1L1D1L1D1L1D2R4L1U
4D6BR1BD1
158Ø DATA NR4D2R3D1R1D2L1D1L2U1L
1BD1BR4BD1
159Ø DATA BR3L2D1L1D4R1D1R2U1R1U
1L1U1L3BD3BR4BD1
16ØØ DATA ND2R4D2L1D1L1D1L1D1L1D
1BR4BD1
161Ø DATA R4D2L1D1L2U1L1U2BD6NR4
U2R1U1R2D1R1D2BD1
162Ø DATA BD1R1L1R1U1R2D1R1D2L3U
1L1BD3R1L1R1D1R2U1R1U2BD3BD1
163Ø FOR X=32-32 TO 47-32:READ L
$(X):NEXT X
164Ø DATA BD7BR4
165Ø DATA BR2D1U1D4BD3U1BR2
166Ø DATA BR1D3BR2U3D3BD5BR1
167Ø DATA BR1D1U1D6U2L1R4L1U4D2R
1L4R3D4BR1BD1
168Ø DATA BR2D1U1D6BR2BU5L4D2R4D
2L4BR4BD2
169Ø DATA D1U1BR4D1L1D1L1D2L1D1L
1D1BR4U1D1BD1
17ØØ DATA NR3D1R1D1R1U1R1L1D4L2U
2D2R4U1D1L1D1BD1BR1
171Ø DATA BR2D3BD4BR2
172Ø DATA BR1R2L2D1L1D4R1D1R1BD1
BR1
173Ø DATA BR1R1L1R1D1R1D4L1D1L2B
R3BD1
```

```
174Ø DATA D1R1D1R2U1R1U1BL2BD3L1
D2L1D1BR2BU3R1D2R1D1BL2U6D6U3L2R
4BD4
175Ø DATA BR2BD1D1U1D4U2R2L4BR4B
D4
176Ø DATA BR2BD5D1U1D1L1D1BR3
1765 DATA BD3BR1R2L2BD4BR3
177Ø DATA BR2BD5D1BD1BR2
178Ø DATA BR4D1U1D1L1D1L1D2L1D1L
1D1BR4BD1
179Ø FOR X=58-32 TO 64-32:READ L
$(X):NEXT X
18ØØ DATA BR1BD1D1R1U1L1BD3D1R1U
1L1BD3BR3
181Ø DATA BR1BD1D1R1U1L1BD4D1R1U
1L1D1R1D1BR2
182Ø DATA BR3D1U1D1L1D1L1D1L1R1D
1R1D1R1D1BD1BR1
183Ø DATA BR1BD2R2L2BD2R2L2BD2BR
3BD1
184Ø DATA BR1D1U1D1R1D1R1D1R1L1D
1L1D1L1D1BD1BR3
185Ø DATA BD1D1U1R1U1R2D1R1D1L1D
1L1D1BD1D1BR2BD1
186Ø DATA BR1R2L2R2D1R1D4L1D1L2U
1L1U2R1U1R1D1R1L1D1R1L1D1R1L1D1B
D1BR2
187Ø RETURN
2ØØØ IFS=Ø THENRUN ELSE PRINT"++
++++++++++++++++++++++++++++++
    SECTOR EDIFICATION"
2ØØ1 S$(Ø)="SEC/SUBJECT###   AMO
UNT"
2Ø3Ø FORX=1TO15ØØ:NEXTX
2Ø4Ø B=1
2Ø46 A=32
2Ø5Ø IFS>14THENE=14ELSEE=S
2Ø51 IFGF=-1THENGF=Ø:GOTO2Ø6Ø
2Ø55 CLS
2Ø6Ø PRINT@Ø,"";
2Ø61 IFB<1THENGF=-1:GOTO2Ø4Ø
2Ø62 IFE>S THENE=E-1:B=B-1
2Ø63 IFS<15THENCLS
2Ø69 PRINTS$(Ø)
2Ø7Ø FORX=B TOE
2Ø8Ø PRINT" "+CHR$(X+64)+". "+S$
(X);
2Ø9Ø PRINTTAB(17)"?";S(X)
2Ø95 NEXTX
21ØØ PRINT@A,CHR$(128);
211Ø A$=INKEY$:IFA$=""THEN211Ø
2111 IFA$=CHR$(12)THEN78Ø
2112 IFA$="D"THEN22ØØ
2113 IFA$="A"ANDE=S THEN223ØELSE
IFA$="["ANDE=S THEN 223Ø
2115 PRINT@A,CHR$(32);
212Ø IFA$=CHR$(1Ø)THENA=A+32:IFA
>448THENA=A-32:B=B+1:E=E+1:GOTO2
Ø6Ø
213Ø IFA$=CHR$(94)THENA=A-32:IFA
<32THENA=A+32:B=B-1:E=E-1:GOTO2Ø
6Ø
2135 IFA$=CHR$(9)THEN216Ø
214Ø IFA>(S*32)THENA=A-32
215Ø GOTO21ØØ
216Ø A=A+3
2165 X=PEEK(A+1Ø22)-64
217Ø PRINT@A,CHR$(32);
218Ø LINEINPUT S$(X):PRINTBS$;:I
NPUTS(X)
219Ø A=A-3:GOTO2Ø6Ø
22ØØ X=PEEK(A+1Ø25)-64
221Ø FORD=X TOS
222Ø S$(D)=S$(D+1):S(D)=S(D+1):N
EXTD:S=S-1:S$(Ø)="SEC/SUBJECT###
   AMOUNT":IFE>STHENIFS<15THENE=
E-1:B=1:A=A-32ELSEB=B-1:E=E-1
2221 IFS=14THENA=448
2222 IFA=ØTHENA=32
2223 IFS=ØTHENRUN
2224 GOTO2Ø6Ø
223Ø GOSUB228Ø:IF X+LP>23 THEN 2
Ø6Ø
2231 X=X-1:FORLL=1TOLP:X=X+1
224Ø S=S+1:PRINT@A,CHR$(32);:A=A
+32:PRINT@A,"";
225Ø PRINTCHR$(128)+CHR$(X+64)+"
. ";:LINEINPUTS$(X)
226Ø PRINTBS$;:INPUTS(X)
2265 IFA=48ØTHENA=448
2266 IFS<15THENE=E+1ELSEB=B+1:E=
E+1
227Ø NEXT LL:GOTO2Ø6Ø
228Ø FORLP=1TO1ØØ:A$=INKEY$:IFVA
L(A$)>ØANDVAL(A$)<1ØTHENLP=VAL(A
$):RETURNELSENEXTLP:LP=1:RETURN
3ØØØ IF S=Ø THEN RUN ELSECLS:PRI
NT"*****************************
****"
3ØØ1 PRINT" CHANGE SUBJECT FROM.
.."
3Ø1Ø PRINT:PRINT:PRINTSB$;
3Ø2Ø PRINT:PRINT"TO"
3Ø3Ø LINEINPUTSB$
3Ø4Ø GOTO78Ø
4ØØØ IF S=Ø THEN RUN ELSE IFS>2Ø
THENPRINT"NO ROOM FOR A NOTE":FO
RT=1TO1ØØØ:NEXTT:GOTO78Ø
4Ø1Ø CLS:PRINT"@@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@"
4Ø2Ø PRINT" CHANGE NOTE FROM..."
4Ø3Ø PRINTNT$
4Ø4Ø PRINT"TO"
4Ø5Ø LINEINPUTNT$
4Ø6Ø GOTO78Ø
```

Investment Analysis

```
1Ø DIM A(15),PV(15),CV(15)
15 CLS(Ø)
2Ø PRINT "NET PRESENT VALUE COMP
UTATION"
25 PRINT "BY DEV CHAKRAVARTY"
26 PRINT " "
3Ø PRINT "NET PRESENT VALUE (NPV
) CONCEPT":PRINT" "
31 PRINT"WHEREVER PROMPT INDICAT
ES ":PRINT"'PRESS Y' PRESS Y AND
 THEN":PRINT"HIT ENTER KEY"
32 PRINT " ":INPUT "PRESS Y TO C
ONTINUE";M$
34 IF M$="Y" THEN 4Ø ELSE GOTO 2
Ø
4Ø PRINT "$1ØØ AVAILABLE TODAY I
S WORTH"
43 PRINT "MUCH MORE THEN $1ØØ AV
AILABLE"
46 PRINT "AFTER FIVE YEARS BECAU
SE OF THE"
49 PRINT "ERODING VALUE OF MONEY
 CAUSED"
52 PRINT"MAINLY BY INFLATION"
53 INPUT "PRESS Y TO CONTINUE";M
$
54 IF M$="Y"THEN55 ELSE GOTO 2Ø
55 CLS:PRINT"THIS PROGRAM ALLOWS
 THE DECISION"
58 PRINT"MAKER TO TAKE THIS INTO
 ACCOUNT"
59 PRINT"WHEN MAKING INVESTMENT
DECISIONS"
6Ø PRINT"WHICH REQUIRE CASH INVE
STMENTS"
63 PRINT"INITIALLY AND PAY BACK
SUMS"
66 PRINT"IN FUTURE YEARS. NPV EX
PRESSES"
69 PRINT"THESE FUTURE AMOUNTS IN
 PRESENT"
7Ø PRINT"TERMS AND SETS THIS AMO
UNT OFF"
73 PRINT"AGAINST THE INITIAL CAS
H OUTLAY"
76 PRINT"IF THE NPV IS POSITIVE
IT IS "
79 PRINT"PROBABLY WORTH INVESTIN
G IN"
85 INPUT "PRESS Y TO CONTINUE";M
$
1ØØ ZERO = Ø
1Ø2 CLS(Ø)
11Ø FOR U = 1 TO 15
12Ø A(U) = ZERO
13Ø PV(U) = ZERO
14Ø CV(U) = ZERO
15Ø REM
2ØØ PRINT "THE PROGRAM HANDLES C
ASH FLOWS"
21Ø PRINT "FOR ONLY 15 YEARS.ENT
ER A "
22Ø PRINT "NUMBER BETWEEN 1 AND
15"
23Ø PRINT "REPRESENTING NUMBER O
F YEARS"
24Ø PRINT "FOR WHICH YOU CAN EST
IMATE"
245 PRINT "CASH FLOWS"
25Ø INPUT YEAR
255 INPUT "INITIAL CASH INVESTME
NT $";INITIAL
26Ø FOR X = 1 TO YEAR
27Ø PRINT "ENTER CASH FLOW FOR Y
EAR"X"$"
3ØØ INPUT A(X)
31Ø NEXT X
32Ø INPUT "ENTER DISCOUNT RATE O
R MARKET RATE OF INTEREST";R
33Ø R = R/1ØØ
34Ø TEMP = 1 + R
35Ø REM
38Ø REM BEGIN CALCULATIONS
4ØØ SUM = Ø
41Ø FOR X = 1 TO YEAR
42Ø GOSUB 2ØØØ
43Ø CV(X) = A(X) * PV(X)
44Ø SUM = SUM + CV(X)
45Ø NEXT X
46Ø REM
47Ø NETPV = SUM - INITIAL
48Ø PRINT "NET PRESENT VALUE IS
$"NETPV
49Ø INPUT "PRESS Y TO SEE NPV CO
MPUTATION";N$
5ØØ IF N$="Y"THEN GOSUB 3ØØØ
55Ø PRINT "NOW PROCEED TO IRR CA
LCULATION"
552 INPUT "PRESS Y TO CONTINUE";
C$
553 IF C$="Y"THEN 554
554 CLS(Ø)
56Ø PRINT"INTERNAL RATE OF RETUR
N IRR"
565 PRINT"GIVES THE MINIMUM DISC
OUNTING"
57Ø PRINT "RATE THAT YIELDS A PO
SITIVE"
575 PRINT"NPV"
576 PRINT "WAIT!THE PROGRAM IS W
ORKING"
6ØØ REM CALCULATION OF IRR
61Ø XYZ = 1.3Ø
62Ø TEMP = XYZ
63Ø REM
64Ø FOR Q=1 TO 3Ø
65Ø SUM = ZERO
66Ø TEMP = TEMP -Ø.Ø1
67Ø REM
68Ø FOR X = 1 TO YEAR
69Ø GOSUB 2ØØØ
7ØØ CV(X) = A(X)*PV(X)
71Ø SUM=SUM+CV(X)
72Ø NEXT X
73Ø REM
74Ø NETPV = SUM - INITIAL
75Ø IF NETPV > Ø THEN GOTO 1ØØØ
76Ø NEXT Q
77Ø IF NETPV < Ø THEN GOTO 1Ø5Ø
1ØØØ REM OUTPUT SECTION
1Ø1Ø IRR = (TEMP-1)*1ØØ
1Ø2Ø PRINT " ":PRINT "THE IRR IS
"IRR"%"
1Ø3Ø GOTO 11ØØ
1Ø5Ø PRINT "THE PROJECT HAS A NE
GATIVE RATE OF RETURN"
11ØØ INPUT "IF YOU WANT TO CONTI
NUE TYPE Y"; ANS$
111Ø IF ANS$ = "Y" THEN 1ØØ
```

Listing continued

```
15ØØ END
16ØØ REM
2ØØØ REM SUBROUTINE CALCULATES P
RESENT VALUE
2Ø1Ø PV(X) =1
2Ø2Ø FOR Z = 1 TO X
2Ø3Ø PV(X) = TEMP * PV(X)
2Ø4Ø NEXT Z
2Ø5Ø PV(X) = 1/PV(X)
2Ø6Ø RETURN
3ØØØ REM SUBROUTINE DISPLAYS COM
PUTAION
3Ø1Ø CLS(Ø)
3Ø2Ø FOR X=1 TO YEAR
3Ø3Ø PRINT "YEAR" X  "CASH INFLO
W"A(X)
3Ø4Ø PRINT"AMOUNT IN TODAYS TERM
S $"CV(X)
3Ø42 INPUT "PRESS Y TO  CONTINUE
";N$
3Ø43 IF N$="Y" THEN 3Ø45
3Ø45 NEXT X
3Ø5Ø PRINT"LESS INITIAL OUTLAY $
"INITIAL
3Ø6Ø PRINT "NPV IS $"NETPV
3Ø7Ø RETURN
```

Fabulous Fonts for the Gemini-10X

Program Listing. Fabulous Fonts

```
1Ø GOTO56Ø:'DLCSET: G-1ØX DOWNLO
AD CHRS
2Ø CLEAR5ØØ,&H3A4A:U$=CHR$(239):
L$=CHR$(13):CT$=CHR$(27)+CHR$(42
)+CHR$(1):SS=&H4ØØ:J2=Ø:J3=J2:LØ
=&H3A4B:L9=LØ+96Ø:CLSØ:PRINT@169
,"CLEARING MEMORY";:FORI=LØ TOL9
STEP1Ø:POKEI,255:NEXT
3Ø CLS:INPUT"ready printer";A$:B
=3ØØ:FORI=1TO6:READBAUD(I):PRINT
I;">";B:B=B*2:NEXT:INPUT"BAUD (1
-6)";B:IFB>ØTHENPOKE15Ø,BAUD(B)
4Ø PRINT#-2,CHR$(27);"@";
5Ø INPUT"J>OYSTK OR K>EYBD";A$:I
FA$="J"THENLM=255:K7=9/64:K6=6/6
3ELSELM=Ø
6Ø GOSUB52Ø
7Ø LL=32*Y+X:L=SS+LL:Z=PEEK(L):P
RINT@LL,U$;:POKEL,Z
8Ø IFLM THENX=INT(JOYSTK(Ø)*K7):
Y=INT(JOYSTK(1)*K6)
9Ø A$=INKEY$:IFA$=""THEN7ØELSEIF
LM THEN14ØELSEA=ASC(A$)
1ØØ IFA=9THENX=X-(X<8):GOTO7Ø
11Ø IFA=8THENX=X+(X>Ø):GOTO7Ø
12Ø IFA=1ØTHENY=Y-(Y<6):GOTO7Ø
13Ø IFA=94THENY=Y+(Y>Ø):GOTO7Ø
14Ø IFA$="D"THEN31Ø
15Ø IFA$="S"THENPOKEL,128:GOSUB3
2Ø:GOTO7Ø
16Ø IFA$="R"THENPOKEL,11Ø:GOSUB3
2Ø:GOTO7Ø
17Ø IFA$="C"THEN6Ø
18Ø IFA$="Q"THENSTOP
19Ø IFA$="L"THEN48Ø
2ØØ IFA$="W"THEN49Ø
21Ø IFA$="V"THEN39Ø
22Ø IFA$="T"THENPRINT#-2,CHR$(27
);CHR$(36);CHR$(1);:A$="":FORI=3
2TO128:A$=A$+CHR$(I):NEXT:PRINT#
-2,A$:GOTO6Ø
23Ø IFA$<>"P"THEN28Ø
24Ø PRINT@75,"PROGRAMMING PRINTE
R";:PRINT#-2,CHR$(27);CHR$(42);C
HR$(Ø);:L=LØ:A$=STRING$(1Ø,32):J
=VARPTR(A$):J2=J+2:J3=J+3:POKEJ,
1Ø:FORI=32TO128
25Ø IFPEEK(L)=255THEN27Ø
26Ø X=INT(L/256):POKEJ2,X:POKEJ3
,L-X*256:PRINT#-2,CT$;CHR$(I);A$
;
27Ø L=L+1Ø:NEXT:GOTO6Ø
28Ø IFA$<>"U"THEN7Ø
29Ø GOSUB44Ø:FORX=ØTO8:L=L+1:POK
EL,V(X):NEXT
3ØØ GOTO6Ø
31Ø GOSUB 44Ø:FORX=ØTO8:PRINT@32
Ø,STRING$(22,32);:PRINT@32Ø,"COL
. "X;:INPUTH:L=L+1:POKEL,H:NEXT:
PRINT@32Ø,STRING$(3Ø,32);:GOTO4Ø
Ø
32Ø M=1:H=Ø:R=X+SS
33Ø FOR C=ØTO6
34Ø IFPEEK(R)=128THENH=H+M
35Ø R=R+32:M=M*2:NEXT:V(X)=H
36Ø GOSUB38Ø
37Ø RETURN
38Ø H$=RIGHT$("Ø"+HEX$(H),2):PRI
NT@256+X,LEFT$(H$,1);:PRINT@288+
X,RIGHT$(H$,1);:RETURN
39Ø GOSUB52Ø:GOSUB46Ø:IFPEEK(L)=
255 THENPRINT@339,"UNDEFINED";:G
OTO9Ø
4ØØ FORX=ØTO8:L=L+1:H=PEEK(L):M=
1:FORY=ØTO6
41Ø IF(H ANDM)>Ø THENPOKEY*32+X+
SS,128
42Ø M=M*2:NEXT:V(X)=H:GOSUB38Ø:N
EXT:X=Ø:Y=X:PRINT@32Ø,"      ";:I
FPEEK(L-9)=ØTHENPRINT"NO ";ELSEP
RINT"";
43Ø PRINT"DESCENDERS";:GOTO9Ø
44Ø GOSUB45Ø:POKEL,D:RETURN
45Ø PRINT@32Ø,STRING$(3Ø,32):PRI
NT@32Ø,"DESCENDERS ";:INPUTA$:IF
A$="Y"THEN D=1 ELSED=Ø
46Ø PRINT@32Ø,"ENTER CHARACTER:"
;:LINEINPUTA$:IFLEN(A$)=4ANDLEFT
$(A$,2)="&H"THENAC=VAL(A$)ELSEIF
LEN(A$)=1THENAC=ASC(A$)ELSE46Ø
47Ø IFAC<ØTHEN46ØELSEL=LØ+(AC-32
)*1Ø:RETURN
48Ø GOSUB5ØØ:LOADM FF$:GOTO6Ø
49Ø GOSUB5ØØ:SAVEM FF$,LØ,L9,Ø:G
OTO6Ø
5ØØ PRINT@32Ø,"CURRENT NAME:";FF
$:INPUT"NEW NAME";A$:IFA$<>""THE
NFF$=A$
51Ø IF FF$=""THEN5ØØELSERETURN
52Ø CLS:FOR X=ØTO6:V(X)=Ø:PRINTS
TRING$(9,"."):CHR$(255):NEXT:V(7
)=Ø:V(8)=Ø:PRINT@19,"GEMINI";:PR
INT@46,"CUSTOM-DESIGNED";:PRINT@
81,"CHARACTERS";:PRINT@32Ø,"use
cursor";
53Ø PRINT@384,"<S>ET <R>ESET <U>
PDATE <C>LS"L$"<D>IRECT ENTRY <Q
>UIT <V>IEW"L$"<P>ROGRAM <L>OAD
<W>RITE <T>EST"
54Ø FOR C=224TO233:PRINT@C,CHR$(
255);:NEXT:X=Ø:Y=X:RETURN
55Ø DATA18Ø,87,41,18,7,1
56Ø PCLEAR1:GOTO2Ø
```

How Your CoCo Adds Up

Program Listing 1. Binary OR Drill

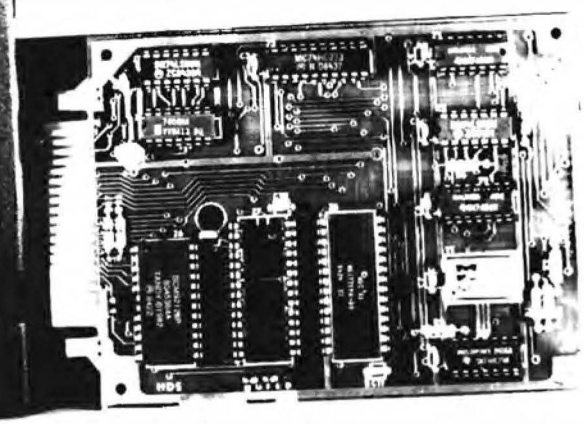
```
1Ø DIM A1(7),A2(7),AN(7)
2Ø CLS
3Ø PRINT@11,"BINARY OR"
4Ø H1=RND(256)-1:H2=RND(256)-1
5Ø HX=H1
6Ø FOR B=7TOØSTEP-1
7Ø GOSUB44Ø
8Ø A1(B)=INT(HX/B1)
9Ø HX=HX-(A1(B)*B1)
1ØØ NEXT
11Ø HX=H2
12Ø FOR B=7TOØSTEP-1
13Ø GOSUB44Ø
14Ø A2(B)=INT(HX/B1)
15Ø HX=HX-INT(A2(B)*B1)
16Ø NEXT
17Ø PRINT@69,A1(7);
18Ø FOR I=6TOØSTEP-1
19Ø PRINT A1(I);
2ØØ NEXT
21Ø PRINT@98,"OR";
22Ø PRINT@131,"----------------
--------";
23Ø PRINT@1Ø1,A2(7);
24Ø FOR I=6TOØSTEP-1
25Ø PRINT A2(I);
26Ø NEXT
27Ø FOR I=ØTO7
28Ø PRINT@187-3*I,CHR$(128);
29Ø A$=INKEY$:IF A$=""THEN29Ø
3ØØ IF(A$<>"Ø")AND(A$<>"1")THEN2
9Ø
31Ø AN(I)=VAL(A$)
32Ø PRINT@187-3*I,A$;
33Ø NEXT
34Ø A=Ø
35Ø FOR B=ØTO7
36Ø GOSUB44Ø
37Ø A=A+(AN(B)*B1)
38Ø NEXT
39Ø IF A<>(B1 OR H2)GOTO42Ø
4ØØ PRINT@296,"    RIGHT!      "
;
41Ø FOR I=1TO1ØØØ:NEXT:GOTO2Ø
42Ø PRINT@296,"WRONG,TRY AGAIN "
;
43Ø GOTO27Ø
44Ø IF B=Ø THEN B1=1:RETURN
45Ø B1=1
46Ø FOR J=1TO B:B1=2*B1:NEXT
47Ø RETURN
```

Program Listing 2.
Hexadecimal Addition Drill

```
1Ø CLS
2Ø PRINT@1Ø,"HEX-ERCISE"
3Ø PRINT@41,"BYTE ADDITION"
4Ø B1=RND(128)-1:B2=RND(128)-1
5Ø M1=INT(B1/16):L1=B1-(M1*16)
6Ø M2=INT(B2/16):L2=B2-(M2*16)
7Ø IF L1<1ØTHEN PRINT@142,STR$(L
1);:GOTO9Ø
8Ø PRINT@143,CHR$(L1+55);
9Ø IF M1<1ØTHEN PRINT@141,STR$(M
1);:GOTO11Ø
1ØØ PRINT@141,CHR$(M1+55);
11Ø PRINT@172,"+ ";
12Ø IF L2<1ØTHEN PRINT@174,STR$(
L2);:GOTO14Ø
13Ø PRINT@175,CHR$(L2+55);
14Ø IF M2<1ØTHEN PRINT@173,STR$(
M2);:GOTO17Ø
15Ø PRINT@173,CHR$(M2+55);
16Ø PRINT@172,"+";
17Ø PRINT@2Ø4,"----";
18Ø PRINT@239,CHR$(128);
19Ø A$=INKEY$:IF A$=""THEN19Ø
2ØØ PRINT@239,A$;
21Ø PRINT@238,CHR$(128);
22Ø B$=INKEY$:IF B$=""THEN22Ø
23Ø PRINT@238,B$;
24Ø IF(A$<"Ø")OR(A$>"F")THEN35Ø
25Ø IF(B$<"Ø")OR(B$>"F")THEN35Ø
26Ø IF A$<="9"THEN A=VAL(A$)
27Ø IF A$>="A"THEN A=ASC(A$)-55
28Ø IF B$<="9"THEN B=VAL(B$):GOT
O31Ø
29Ø IF B$>="A"THEN B=ASC(B$)-55:
GOTO31Ø
3ØØ GOTO35Ø
31Ø AN=A+(16*B)
32Ø IF AN<>(B1+B2)THEN35Ø
33Ø PRINT@296,"    RIGHT!      "
;
34Ø FOR I=1TO1ØØØ:NEXT:GOTO1Ø
35Ø PRINT@296,"WRONG,TRY AGAIN";
:GOTO18Ø
```

END

2nd Generation !!!!! HDS Floppy Drive Controller Board



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NEW ROM

HDS has licensed the ROM from RadioShack to be able to offer alternative operating systems pre-blown ready for installation. The first of what we hope to be a wide range of options is ADOS. ADOS is a product of SpectroSytems of Miami, Florida and is fully supported by the author. The HDS version of ADOS supports 2 drives, 40 track, 6ms trk-to-trk drives only either Single Sided or Double Sided. The ADOS package comes complete with original documentation and diskette from SpectroSystems and can be installed in our Drive Controller Board at purchase time for no additional charge.

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Continued from p. 41

16K to 32K Piggyback—Moderate

This upgrade applies to all CoCos, but note that the CoCo 2 uses different chips.

If you shop, you can get a set of 64K RAM chips for under $30, so this upgrade makes sense only if you received the 16K chips free. This modification requires soldering, preferably with the memory chips outside of your machine. The original CoCos require 4116 dynamic RAM chips, and the CoCo 2 requires 2118 dynamic RAMs.

Open the CoCo. To be on the safe side, first remove the original RAM chips and replace them with the ones you plan to piggyback. If they prove to be good, proceed as follows: Place the original chips in a piece of conductive foam in approximately the same configuration as they go in the board.

With each of the new chips, gently bend pin 4 straight up (the fourth pin down from the notch on the left side) using long-nose pliers. Gently squeeze the remaining pins inward a small amount so that when placed over a chip in the foam, it will hug it and not fall off. With the exception of pin 4, solder each pin of the new chip to the corresponding pin of the chip beneath it.

Caution: Do not use excessive amounts of solder or hold the iron too long. Solder a piece of wire to each of the bent-up pin 4's connecting them all and leaving enough slack so that you can replace the piggybacked chips in their sockets.

Remove the 6883 SAM chip and place it in the conductive foam. Pin 40 is the first pin to the right of the notch. Counting backwards on the right side, locate pin 35 (the sixth pin from the top). Solder one end of a 33-ohm, ¼-watt resistor to the top of the SAM chip's pin 35 so that you can replace it in its socket.

Bend the resistor lead so that the resistor rests on top of the SAM and the lead points toward the RAM chips. Return the SAM to its socket and solder a wire connecting the unused lead of the resistor to the most convenient pin 4 of the RAMs (Fig. 2). Do not move the jumpers. Close up the machine and you are done.

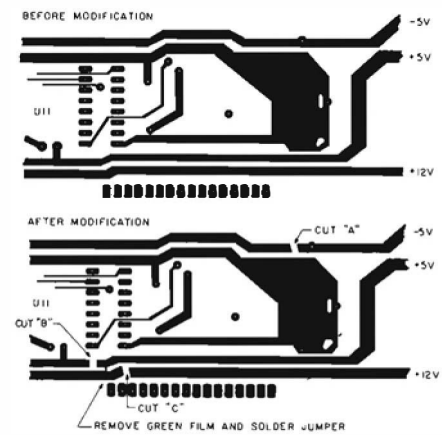


Fig. 3. Foil Side of PC Board

4 or 16K to 64K, D Boards—Difficult

You must first convert the D board to an E board. Check to see if you have a 1.1 or 1.2 Color Basic ROM by typing EXEC 41175. If you have the 1.0 version, order the updated ROM, Radio Shack no.

The Other Korean CoCo—A Different Story

Until recently, upgrading all models of the Color Computer involved, among other things, replacing the eight memory chips with eight 64K by 1-bit dynamic RAM chips, usually designated by the number 4164.

Around January of this year, Tandy quietly introduced a new version of the Color Computer 2 with a new catalog number, 26-3134A for the 16K Color Basic model and 26-3136A for the 16K Extended Basic model. The A-version boards have been extensively redesigned. What follows is the 64K upgrade procedure for these boards and a technical rundown.

The Newest 64K Upgrade

Tandy now uses 4-bit wide 16K dynamic RAM chips in its CoCo 2's. This means that there are only two RAM chips in the CoCo rather than eight. The chips in the current 16K A models are Texas Instruments 4416 chips. They are socketed and located more or less in the center of the board. On either side of this pair of 18-pin chips is a white female connector. This connector will allow for a plug-in satellite board for 64K upgrades.

But this satellite board would be quite clumsy, getting in the way of other hardware add-ons (e.g., lowercase kits and video drivers). (Ed. note: Apparently Radio Shack is upgrading these latest CoCos by replacing the entire board.)

But I know of two IC manufacturers who are delivering those 64K RAM chips at this writing: Hitachi (part number 50464) and NEC (part number 41254). Do not confuse the NEC number with the 41256 1-bit wide by 256K dynamic RAM chip. These chips currently sell for $25 to $35 each. Very soon at least two other chip manufacturers will offer similar chips. Texas Instruments will introduce its 4464 chip and Micron Technologies will introduce its 4064 chip. Intel might offer its own version, too, so I expect prices to drop on the 4-bit by 64K RAM chips.

All of the above chips should work for the CoCo 2A 64K upgrade, which is simplicity itself. First, remove the two socketed 16K RAMs (labeled TMS4416) and replace them with your two 4-bit by 64K RAMs, aligning the notches on both chips and sockets. Then solder a jumper between the two solder points on the front (i.e., closer to the keyboard) right part of your CoCo board: they are clearly marked "64K RAM" and enclosed in a little rectangular white outline. That's all there is to it!

I used the NEC chips for this upgrade and have experienced no problems.

Technical Details

The CoCo 2A uses a new SAM chip, 74LS285. It is the only chip other than memory socketed on the main board and is very similar to the old SAM, but it possesses 256-cycle refresh circuitry rather than the 128-cycle circuitry of the old SAM. This is to accommodate the new 4-bit by 64K RAMs. The new SAM will work with older CoCos, but the old SAM will not work with the 2A CoCos.

The new SAM also has extra circuitry so that it can support a full 64K RAM, 32K ROM CoCo without the extra NOR gate added externally to all older CoCos.

There is a new buffer chip between the memory and CPU. Older CoCo used a 74LS244 octal buffer; the 2A uses a TI 74LS623 octal transceiver chip. It serves a similar function.

The 2A's ROM hardware is much changed. It has one 28-pin socket for the on-board ROM operating system. On the Color

AXX3052. With the correct ROM version in the computer or in hand, open the CoCo.

Disconnect the power supply from the PC board. It has five plug-in leads. Remove the 10 Phillips-head screws that hold the PC board. Then pop the 16 metal fasteners that protrude through the board. Remove the board from its base. Now follow these steps in order:

- Remove the eight RAM chips, U20 through U27. These will be labeled 4027 if you have 4K or 4116 if you have 16K. If you have already performed the piggyback modification, remove the wire from the SAM's pin 35.
- Remove the 6883 SAM chip, U10, exercising great care since it is highly susceptible to static discharge.
- Turn the PC board over so that you are looking at the foil side. Referring to Fig. 3, cut the following lands: the −5-volt land at label A, the +5-volt land at label B, and the +12-volt land at label C. Make the cuts cleanly and about 1/16-inch wide. Use a high-quality cutting tool. We used an X-Acto knife with a #11 blade.
- Remove a portion of the green film at point D to expose the lands for soldering. Solder a small wire jumper at point D. We used approximately ¼ of an inch from the lead of a ¼-watt resistor. Any solid conductor wire of about the same diameter would suffice. This connects the +5 volts to the old +12-volt line, which will provide the 64K RAM chips with +5 volts to their pin 8's.
- Turn the PC board back over to the component side. Locate capacitors C48, C70, C45, C67, C35, C64, C61, and C31. Using a soldering iron, carefully remove these capacitors.
- On the PC board's component side, locate the area above capacitor C75, to the right of the SAM's pin 26, and below the screw hole. After you have found this area, hold the PC board up to a light and mark a dot in the center, being careful not to mark over a land. Then drill a hole at this mark just large enough to pass an insulated wire.
- Prepare a 33-ohm, ¼-watt, 10-percent resistor as follows:
- Cut one lead to 3/8 of an inch and solder it to about 6 inches of insulated wire as used above and cover the solder with spaghetti insulation or electrical tape.
- Bend the other lead at a 90-degree angle and install it into the hole previously occupied by capacitor C48. This is the hole closest to the board's bottom edge.
- Solder the resistor in place.
- Route the insulated wire through the previously drilled hole to the PC board's foil side. This wire should be routed to the land that connects to the SAM socket's pin 35.
- Cut the insulated wire to length and remove approximately ⅛ of an inch of insulation from the end.
- Very carefully solder the stripped wire end to pin 35 on the SAM socket. This now connects the 4164's pin 9's to address line A7.
- Check all connections, cuts, and so on to ensure that no solder bridges or metal fragments remain to short the lands.
- Remove the 4K/16K jumper that lies between the two PIAs, U4 and U8 on top of the board.
- Wire-wrap a length of 30-guage wire to the center post and connect the other end of the wire to PIA U8's pin 17.
- If you have the 1.0 ROM, replace it with a 1.1 or 1.2 version.
- If it is not already set, place the other 4K/16K jumper to the 16K position.
- Install the new 64K RAM chips and replace the SAM chip. Be sure to line up the notches in the sockets with the notches on the chips.
- Proceed to this article's ROM-Write Disabling section.

64K Upgrade, E Boards—Moderate

If you already have a board that Radio Shack calls 32K, make certain that the jumper to the left of U8 connects the center pin with one marked "LOW", and then continue to the ROM-Write Disabling section.

If your E board has 4 or 16K, replace the RAMs with 4164s and set all four jumpers to the 32K position. One jumper is to the right of U10 (the SAM chip) and the other three are just above the keyboard connector. Remove capacitors C48, C70, C45, C67, C35, C64, C61, and C31.

If it is not already installed, add a jumper connecting the LOW and the unmarked center pin to the left of U8 (a PIA). The other pin, marked "HIGH", is not used. Locate the two pins without anything connecting them labeled R83 to the right of U10. Solder in place a 33-ohm, ¼-watt, 10-percent resistor connecting the two pins. You now have what Radio Shack calls a 32K machine. Proceed to the ROM-Write Disabling section below.

ROM-Write Disabling

This procedure applies to E or modified D boards only.

You must disable the ROMs during a write cycle. RAM will occupy the entire address space from $C000 to $FDFF. The interrupt vectors will not be affected since they reside in the protected area from $FF00 to $FFFF. Follow these steps:

- On the component side of the board, locate and remove the two ICs (integrated circuits) labeled U11 and U29. They should be a 74LS138 and a 74LS02.
- Prepare the chips as follows:
- Carefully bend pins 4, 5, and 6 of the 74LS02 straight up (Fig. 2).
- Carefully bend pin 5 of the 74LS138 straight up.
- Solder a short piece of wire to pin 8 on the 74LS02 at the point where the pin enters the chip, as you must plug this pin back into the socket.
- Solder the other end of the wire to pin 6 of the same chip.
- Replace the chips in their sockets.
- Solder a piece of wire from pin 5 of the 74LS138 to pin 4 of the 74SL02.
- Locate TP1 and cut a length or wire that will reach from pin 5 of the 74LS02 to TP1.

by Martin H. Goodman

Basic model, they have plugged into this a 24-pin, 8K by 8 ROM with Color Basic 1.3. When this model is upgraded to Extended Basic, Tandy unplugs the 24-pin ROM and replaces it with a 28-pin, 16K by 8 ROM that contains both Color Basic 1.3 and Extended Basic 1.1.

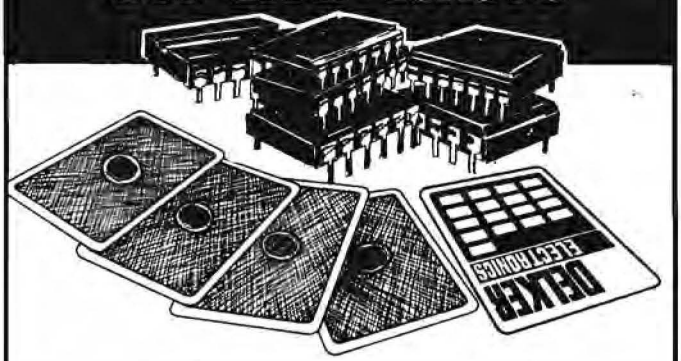
Tandy also has to switch four or five jumpers located near the ROM socket. These jumpers are labeled 64K/128K. The switching of jumpers might require desoldering. The labeling of the jumpers suggest that the 2A can handle 128K of RAM. This is not true. Those designations refer to the number of bits in the ROM chip. They are used to select the different wiring for the 16K by 8 (128K bit) ROM chip. On the Extended Basic 2A, the single 16-pin ROM is soldered directly to the board.

Although the new SAM saves Tandy the use of one NOR gate on the 74LS02 chip, an extra gate is needed to blend together the two chip-select lines from the 74LS138, which formerly selected the two separate ROM chips, into a single select line for the new single ROM chip. Also, the new memory-chip arrangement requires the use of another NOR gate on that 74LS02 in order to properly work the gate timing on the 74LS623.

What about this Basic 1.3? Fortunately, the only changes that Tandy made from the 1.2 ROM were in the SAM setup routine and in the copyright notice logo. The changes for the SAM tell it how to recognize the new RAM chips. Other than that, the two ROM versions are identical.

If you have any questions, feel free to contact me on CompuServe's Color SIG. Type GO PCS 126 at the ! prompt, and then leave a note addressed to my PPN number, 70007,2246.■

It's time we put our chips on the table



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- Solder one end of the wire to pin 5 and wire-wrap the other end to TP1.
- Recheck your wiring and look for any shorts, especially between the 74LS02 and the shield.
- Reassemble your machine.

16K to 64K, 285 (a.k.a. F) Board —Easy

If you have a 32K F board, you need only the 64K Enable software described later in this article. If your F board has 16K, remove capacitors C58, C60, C62, C64, C66, C68, C70, and C72 with a pair of diagonal cutters. Replace your 16K chips with 4164 dynamic RAMs and set the jumpers to the 64K position. You must add another jumper at a location clearly marked "64K".

16K to 64K, U.S.A.-made CoCo 2—Moderate

Open your machine, noting that there are six screws. Remove the 16K chips from the sockets labeled U14 to U21. Solder a wire connecting the two solder pads to the right of W1, which is located diagonally between U6 and U7. Install the new 4164 RAM chips in sockets U14 to U21, aligning the notches. Reassemble the machine.

16K to 64K, Type 1 Korean CoCo 2 —Moderate/Difficult

The level of difficulty for this modification depends on whether the chips are socketed or soldered. If the 16K chips are not socketed, you must remove the PC board from the machine and desolder the chips, replacing them with IC sockets with their notches pointing in the same direction as those on the chips. Note: Desoldering is difficult, and not for amateurs.

The eight 2118 dynamic RAMs are located in two places: a group of three and a group of five. Solder a wire connecting the two solder pads inside the box marked "64K". Install the new 4164 RAM chips in the sockets, aligning the notches. Reassemble your computer.

Testing Your Handywork

Memory Test, Program Listing 1, tells you if you did the upgrade correctly, and it will work with any Color Computer. The E Board test checks to see if your RAMs are active; it writes to the area of RAM that is not in the same address range as your ROMs. If you have a 32K machine and this test checks out, you really have 64K RAMs. The Write to ROM Area test is for those with D or E boards. If it fails, recheck the ROM-Write Disabling section.

Extended Basic Installation

This procedure is the same for all CoCos. Order the Extended Basic kit, Radio Shack catalog no. AXX7072. Open your CoCo or CoCo 2. Install the new ROM in the empty socket that is provided, aligning the notches.

Reassemble your CoCo and type PRINT MEM. You will have 6,144 fewer bytes because Extended Basic reserves that amount of memory for graphics. If you do not plan to use graphics and want to free memory for a large Basic program, type POKE 25,6:NEW for a tape system or POKE 25,14:POKE &HE00,0:NEW for a disk system.

If you have the latest CoCo version (catalog no. 26-3134A), you need a different 16K ROM to replace the 8K Color Basic 1.3. (See sidebar.)

Enabling 64K

Program Listing 2, 64K Enable, puts your computer into 64K (all RAM) mode and keeps it there even when you reset it. Your CoCo's OK prompt appears in reverse video to let you know you are in all-RAM mode. To return to the RAM/ROM mode, cycle power off and on again.■

See program listings on page 45

Richard Esposito and Raymond Rowe are authors of HOT CoCo's *Doctor ASCII column. Write them c/o* HOT CoCo, *80 Pine St., Peterborough, NH 03458.*

UTILITY

by Henry C. Grace, Jr.

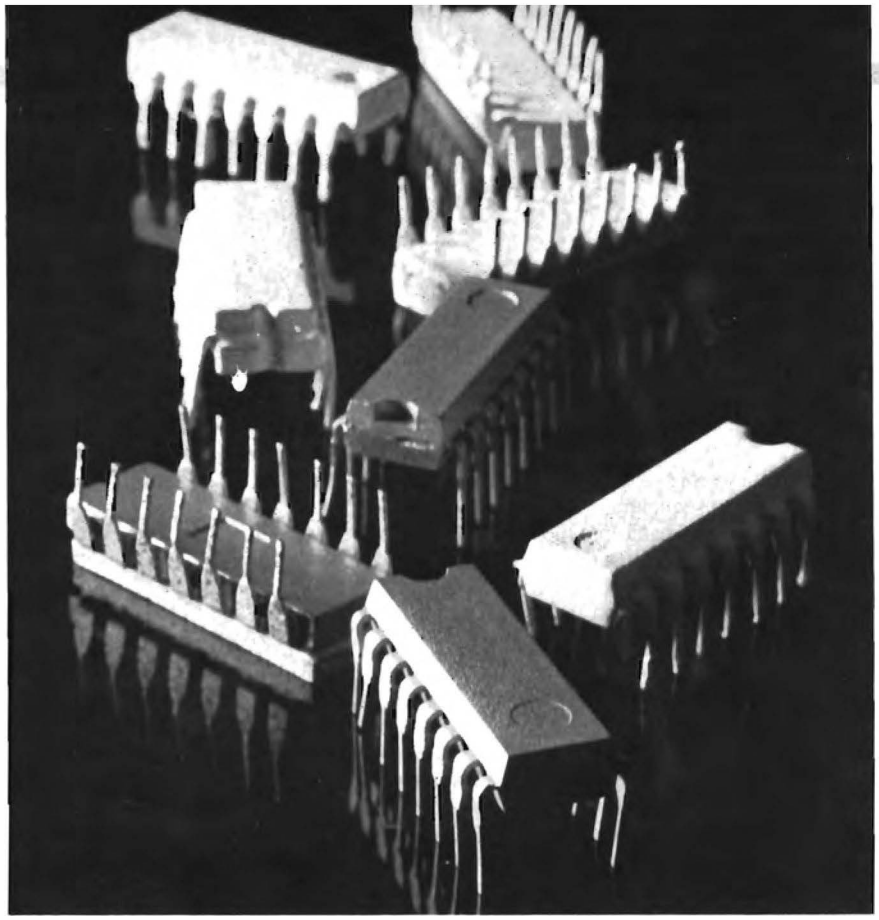

Photo by Edward Judice

The 80K Color Computer

Find that hidden memory and make the most of your CoCo.

Those of you with 32K or 64K CoCos are probably painfully aware of what it costs to use all 64K. You need a disk drive and an alternate operating system to reside in the upper 32K of RAM.

You have probably also seen articles and notes on how to dump your ROM into RAM and activate it. This provides almost 16K of additional RAM for machine-language programming, and, for those who have modified boards, it allows RAM patches. My unmodified 32K machine does not allow such repairs.

These are unsatisfying restrictions on the use of all that memory capacity sitting under your fingertips, and there should be a better way to use it.

Program Listing 1 demonstrates that this extra RAM is accessible and can be used as a separate Basic operating environment. (Program Listing 2 gives the Assembly version of the DATA statements.) You can have two Basic programs loaded into the computer at the same time, one in each 32K bank of RAM. You can execute either program independently of the other, or cause them to interact with each other back and forth between the banks of RAM.

In fact, you can use this technique to manipulate your cassette files. Have you ever used multiple tape saves and loads to reorganize programs on a tape? Now you can simplify the process by loading two programs into the computer at the same time. Or have you ever needed information contained in a program on tape, but you don't want to dump the program presently in memory? Now you can put both programs into memory, select the one you want, and list it. With RAM and ROM, your computer becomes an 80K or more machine.

Background

Type POKE&HFFD5,0 into your 64K computer and it goes into limbo, responding only to the reset button, because memory location $FFD5 selects the alternate bank of RAM. But, when you select it, it is blank, and the Basic interpreter does not have its required pointers in low memory, so the computer rips off, absentmindedly doing its own thing. How can the Basic system be made to run in the alternate RAM bank? Give it the pointers it needs.

Before you do this, you must look at memory location $FFDF, which selects memory map 1. When this address is POKEd it deactivates ROM and activates the alternate RAM bank in place of ROM in the memory map. That is, the RAM becomes the upper 32K of the total of 64K in the computer.

Memory address $FFDE reverses this process, returning the machine to memory map 0. The first machine-language subroutine in Listing 1 (called by USR0 to address 32300) makes use of these two addresses to sequentially load the entire ROM operating system into the alternate RAM bank. When the subroutine returns to Basic, memory map 1 is in effect and the RAM-based operating system is running things. (You might also have seen this technique before in "64K Modification," by Richard Esposito and Raymond Rowe, *HOT CoCo*, July 1983, p. 44.)

You cannot POKE new instructions into the Basic area of an unmodified CoCo (like mine). You are concerned with memory locations from $C000 to $FEFF ($E000 to $FEFF in Disk Basic). You can POKE these addresses to gain almost 16K (almost 8K with Disk Basic) of extra RAM for machine-language programs.

One of the tricks to initializing RAM bank 2 for Basic lies with the second machine-language subroutine (address 32326) in List-

System Requirements

64 or 32K RAM
Extended Color Basic
Editor/Assembler optional

ing 1. The trick is in its placement in memory; the machine code is stored in duplicate in both RAM banks. Keep in mind that, although RAM bank 2 is now serving as the upper 32K, it will soon be returned to an equal status with RAM bank 1. The code is stored in identical address locations in each RAM bank, when you think of each bank as consisting of addresses 0–32767.

This program sequentially duplicates every byte of information from the first RAM bank into the second RAM bank. It works because of the duplicate machine code. When the code selects the second RAM bank, it finds the duplicate right where it should be to keep the CPU working on the task. When the code jumps back to the first RAM bank, it again finds the code right where it needs to be.

Getting Video

When you run Listing 1, you will not notice any change. The video screen will look as it normally looks, though a little massaging of the video RAM page-select register was required to get it. In RAM bank 1 the start of video RAM, VIDRAM, is $400. This is page 2 (bit pattern 0000010) in the video-page-select register (locations $FFC6 through $FFD3). (See the back of the *Getting Started with Color Basic* manual for further information on this register.)

In RAM bank 2, Basic treats VIDRAM no differently; memory $0 to $7FFF are the RAM addresses in both banks, and $400 is VIDRAM. However, the physical realities are different. In RAM bank 2, the video RAM is located in page 66 (bit pattern 1000010) in the video page-select register. If you leave VIDRAM at page 2, or $400, you will not have a video display in RAM bank 2.

By properly setting the video page-select register, VIDRAM is changed to $8400, or page 66, and RAM bank 2 has video. Of course, when you want to change back to RAM bank 1, VIDRAM must be reset to $400, or page 2.

Machine-language subroutine 2 properly sets VIDRAM to $8400 before leaving RAM bank 2 active. It also stores a $39 (RTS) at memory location $0167, disabling a ROM subroutine that resets VIDRAM to page 2 before every PRINT operation. This is why you see a proper video display after you run Listing 1.

Machine-language subroutines 3 and 4 in Listing 1 allow transfer from one RAM bank to the other. Subroutine 3 (address 32353) transfers from bank 1 into bank 2. Just type EXEC 32353 and you will be in bank 2 with proper video. (All this assumes that you have run Listing 1 to store the machine code.) Subroutine 4, called by EXEC 32383, transfers from bank 2 into bank 1, with the video properly set. You cannot use bank 2 for high-resolution graphics.

Using the Method

To set up for Basic in the second RAM bank, enter and run Listing 1. You will be in RAM bank 2 when the OK prompt returns. The Basic program operates in two passes. On the first run through, it stores the machine-language code starting at address 32300. It attempts to store at address 65068, but those addresses are not in RAM yet.

Next, the program uses the USR function to execute the first machine-language subroutine, which copies ROM into RAM and sets memory map 1. The program then loops back and stores the machine-language subroutines again. This time the addresses starting with 65068 are in RAM and the code is stored. After this, the program switches back to memory map 0.

You now have two equally ranked banks of RAM again, but now they have the machine code stored at identical locations. Finally the program calls subroutine 2, which copies RAM bank 1 identically into RAM bank 2 and exits back to Basic in RAM bank 2.

To reenter RAM bank 1, type EXEC 32383 and press enter. EXEC 32353 puts you into RAM bank 2. You can CLOAD, list, and run programs in each RAM bank independently. Just remember that high-resolution graphics will not respond properly in bank 2. In bank 2, avoid all commands like PCLS, PCLEAR, and so on. Also, if you press reset in RAM bank 2, you will return to bank 1. On one occasion I lost the program in RAM bank 2 after pressing reset. However, every other time the program was still there when I switched back to bank 2 again.

Cross Communications

The two RAM banks are independent, but it is possible for them to communicate with a Basic program. Machine-language subroutines 5 and 6 in Listing 1 allow this cross transfer using Basic programs.

Subroutine 5, called by EXEC 32413, transfers from RAM bank 1 into bank 2. Subroutine 6, called by EXEC 32443, transfers from RAM bank 2 into bank 1. Both calls should be made as part of a Basic program, or segment of a program, and stored identically in both RAM banks. Program Listing 3 is a demonstration program for Basic transfers between the two banks.

To use Listing 3, follow this sequence:

- CLOAD Listing 1 and run it;
- enter EXEC 32383 to reenter bank 1;
- CLOAD Listing 2 but do not run it yet;
- enter EXEC 32326 (subroutine 2) to duplicate Listing 2 in bank 2;
- enter EXEC 32383; and
- run.

The program will print messages and input prompts, under Basic control, from both RAM banks. Note from the above sequence that machine-language subroutine 2 duplicates all of RAM bank 1 into RAM bank 2 anytime you execute it. Subroutines 5 and 6, on the other hand, duplicate only the Basic pointers and video RAM in lower memory. This means that programs communicating back and forth can have altogether different variables-table data.

It should be possible, using either Basic or machine-language programs, to devise algorithms that would allow more complete use of all 64K. The trick is to have identically addressed duplicate code in both memory banks. It might even be possible to have two totally different Basic programs running at the same time.

Perhaps you could operate RAM bank 2 as a printer buffer, while another program runs in bank 1. Or perhaps you could write machine-language code to let you use bank 2 as a minidisk emulator to store data for a program running in bank 1. This would give more room in bank 1 for the program.

A simpler way to do all these things is to store required machine-language code in a cartridge ROM. This would allow all the operations I have described to be performed without the need for duplication in the RAM banks. The cartridge ROM would be independent of the RAM areas, and it could preside over both areas in the same way the Basic ROM does.

I would be glad to hear from anyone having ideas or questions about this method, or potential uses for it. (If you want a reply, please send a self-addressed, stamped envelope with your query.)■

See program listing on page 45

Address correspondence to Henry C. Grace, Jr. 424 Ranchwood Drive, Baton Rouge, LA 70815.

by Terry Riegel

Pie in the Sky

You supply the ingredients, your CoCo makes the pie graph.

There are many programs on the market that produce pie graphs. This one won't cost you a penny. You furnish the data; it calculates percentages and displays the graph on your screen. Use a screen-dump utlity to get a printout.

Type in and load Listing 1. The program contains the high-speeed POKE 65495,0, which may confuse certain CoCos. Delete the POKEs in lines 20 and 780 if a menu doesn't appear when you run the program. The opening screen lists seven options:

1. Start.
2. Save to tape.
3. Load from tape.
4. Edit.
5. Change graph name.
6. Change graph comment.
7. View graph.

System Requirements

16K RAM
Extended Color Basic
Printer optional
Screen-Dump Program optional

Illustration by Chris Demarest

Table 1. Sample Data.

Software's Top Ten

1. IBM	$110
2. Radio Shack	110
3. Apple Computer	68
4. Microsoft	68
5. Visicorp	52
6. MicroPro	50
7. Digital Reasearch	44
8. Lotus Development	38
9. Ashton-Tate	33
10. Peachtree	20

(Information from *Computers and Electronics*, July 1984, p. 14.)

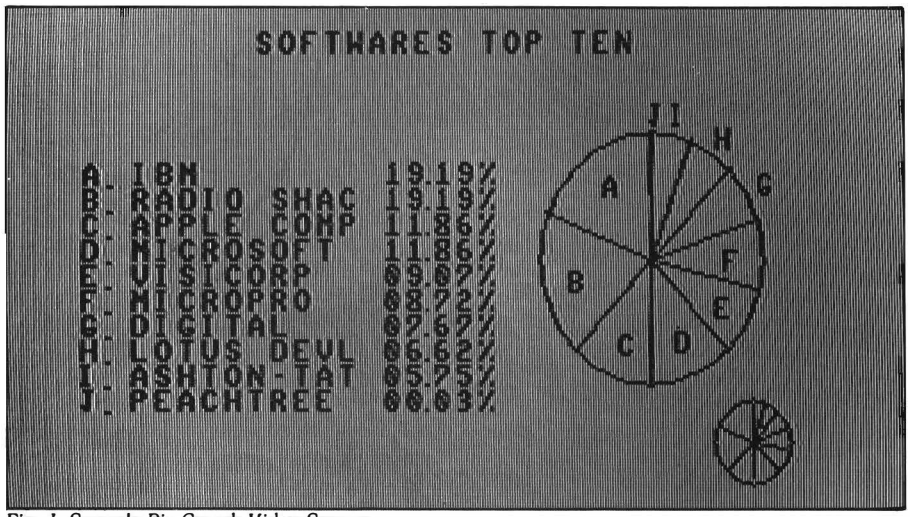

Fig. 1. Sample Pie Graph Video Screen

To submit your data, press 1 (one) and the enter key; the screen prompts you for the number of sectors from 1 to 22. At the next prompt, type in the eight-character sector name and amount for each portion of the graph. You are prompted for the graph title and comments you want to appear below the graph. Press the enter key if you have nothing to submit. When you type 7, a complete listing of the sectors with their respective percentages appears on the screen and you see the graph drawn.

The edit mode displays a complete list of the data you have submitted. A black cursor is in the left margin opposite the first entry. Use the up and down arrows to move it to the appropriate line and the right arrow to change the entry. You must resubmit both the sector name and the amount. If you wish to delete a sector, position the cursor and press D. To add a sector, move the cursor to the last entry, press A and the number of sectors you're adding. The program assumes you have only one new entry if you wait about a second after pressing A. To return to the menu, press the clear key.

I entered the data from Table 1 and printed it out to produce the diagram in Fig. 1. You can use the same data to practice using the program. ■

See program listing on page 50

Address correspondence to Terry Riegel, P.O. Box 389, Laramie, WY 82070.

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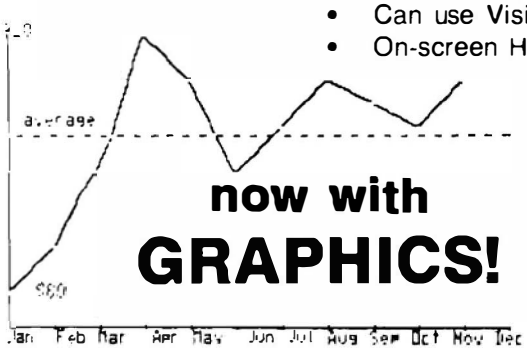

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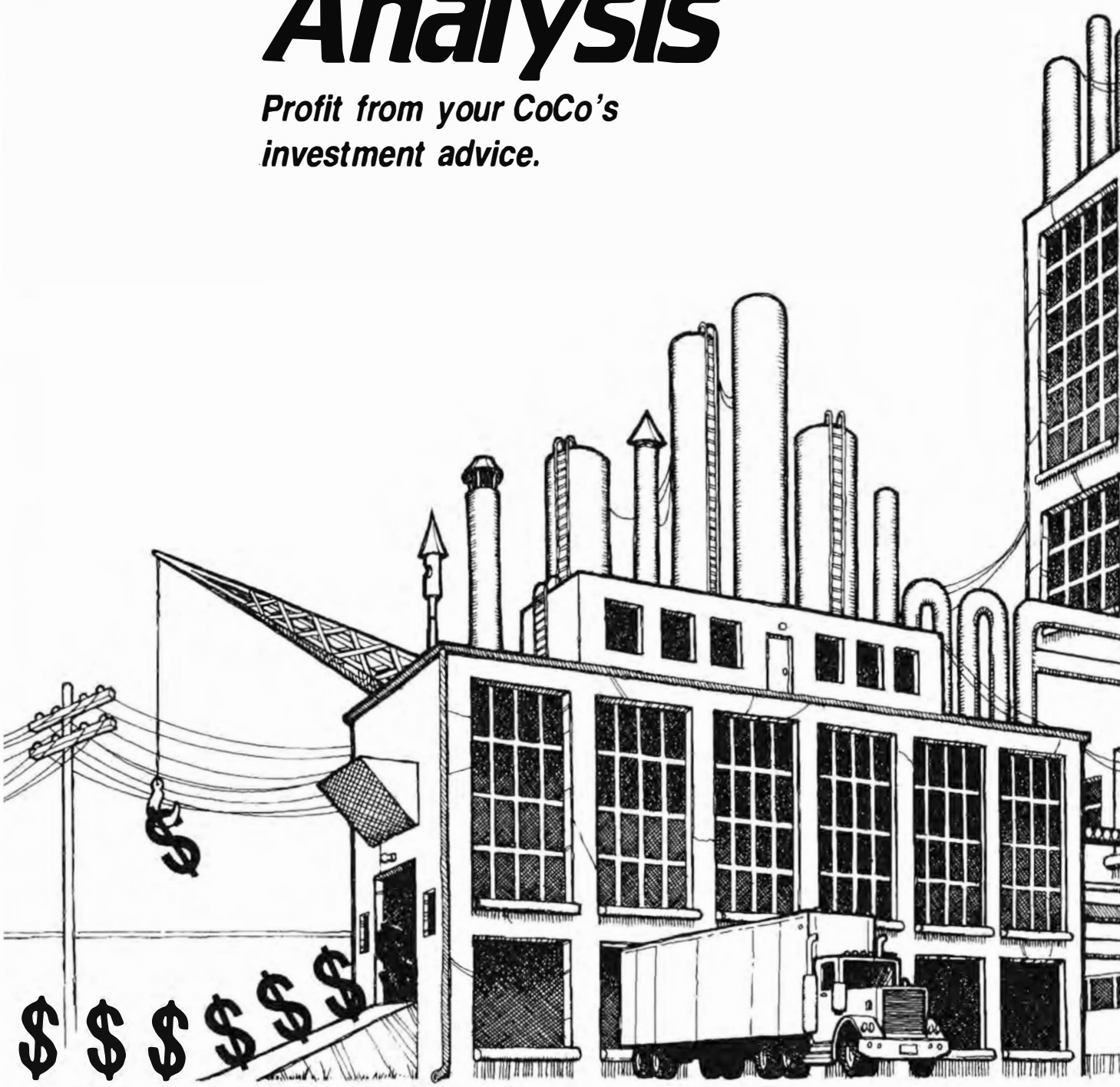
by Dev Chakravarty

Investment Analysis

Profit from your CoCo's investment advice.



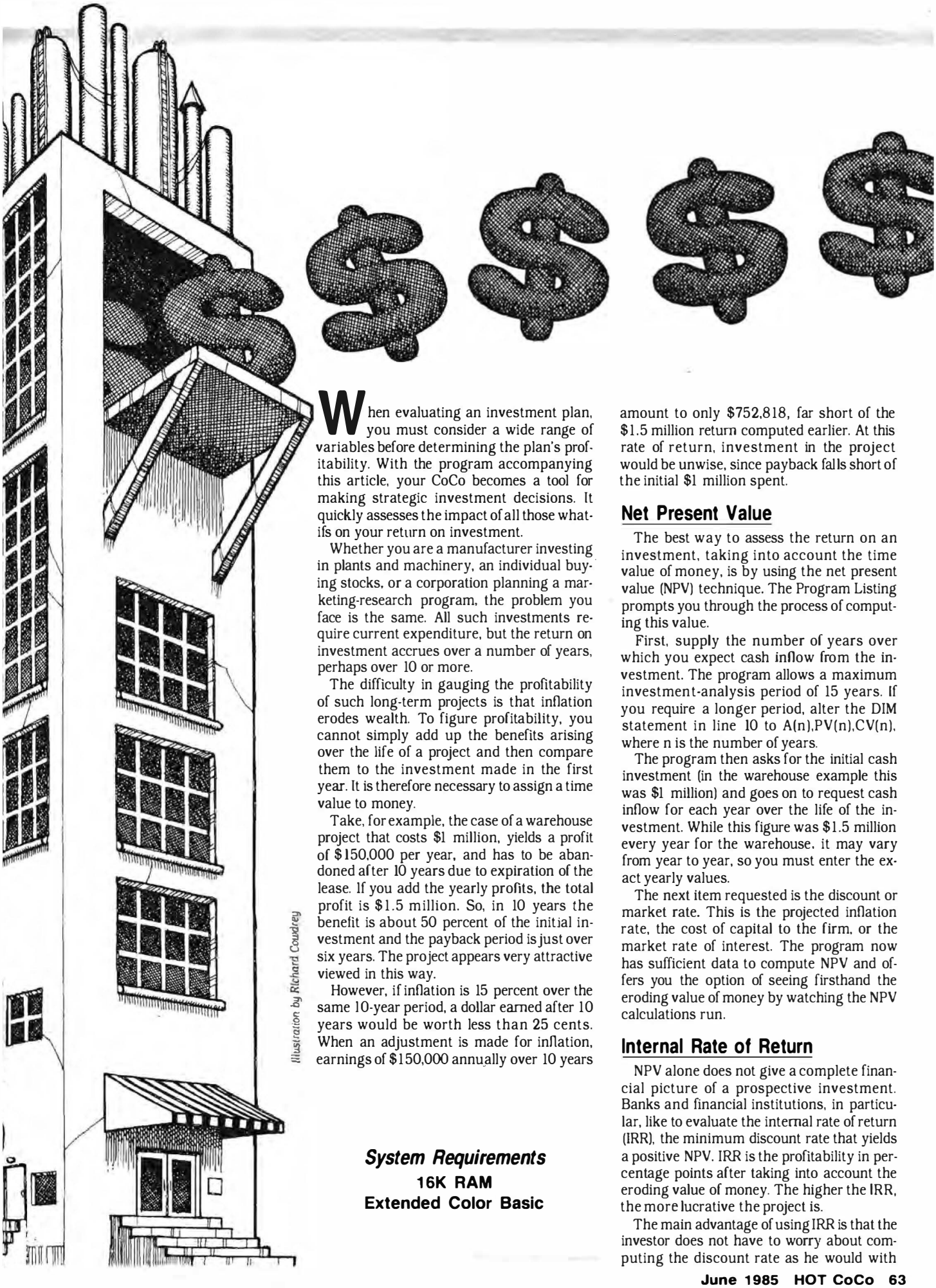


Illustration by Richard Cowdrey

When evaluating an investment plan, you must consider a wide range of variables before determining the plan's profitability. With the program accompanying this article, your CoCo becomes a tool for making strategic investment decisions. It quickly assesses the impact of all those what-ifs on your return on investment.

Whether you are a manufacturer investing in plants and machinery, an individual buying stocks, or a corporation planning a marketing-research program, the problem you face is the same. All such investments require current expenditure, but the return on investment accrues over a number of years, perhaps over 10 or more.

The difficulty in gauging the profitability of such long-term projects is that inflation erodes wealth. To figure profitability, you cannot simply add up the benefits arising over the life of a project and then compare them to the investment made in the first year. It is therefore necessary to assign a time value to money.

Take, for example, the case of a warehouse project that costs $1 million, yields a profit of $150,000 per year, and has to be abandoned after 10 years due to expiration of the lease. If you add the yearly profits, the total profit is $1.5 million. So, in 10 years the benefit is about 50 percent of the initial investment and the payback period is just over six years. The project appears very attractive viewed in this way.

However, if inflation is 15 percent over the same 10-year period, a dollar earned after 10 years would be worth less than 25 cents. When an adjustment is made for inflation, earnings of $150,000 annually over 10 years amount to only $752,818, far short of the $1.5 million return computed earlier. At this rate of return, investment in the project would be unwise, since payback falls short of the initial $1 million spent.

System Requirements

16K RAM

Extended Color Basic

Net Present Value

The best way to assess the return on an investment, taking into account the time value of money, is by using the net present value (NPV) technique. The Program Listing prompts you through the process of computing this value.

First, supply the number of years over which you expect cash inflow from the investment. The program allows a maximum investment-analysis period of 15 years. If you require a longer period, alter the DIM statement in line 10 to A(n),PV(n),CV(n), where n is the number of years.

The program then asks for the initial cash investment (in the warehouse example this was $1 million) and goes on to request cash inflow for each year over the life of the investment. While this figure was $1.5 million every year for the warehouse, it may vary from year to year, so you must enter the exact yearly values.

The next item requested is the discount or market rate. This is the projected inflation rate, the cost of capital to the firm, or the market rate of interest. The program now has sufficient data to compute NPV and offers you the option of seeing firsthand the eroding value of money by watching the NPV calculations run.

Internal Rate of Return

NPV alone does not give a complete financial picture of a prospective investment. Banks and financial institutions, in particular, like to evaluate the internal rate of return (IRR), the minimum discount rate that yields a positive NPV. IRR is the profitability in percentage points after taking into account the eroding value of money. The higher the IRR, the more lucrative the project is.

The main advantage of using IRR is that the investor does not have to worry about computing the discount rate as he would with

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NPV. In addition, the IRR yardstick is easier to understand. The one drawback is the difficulty of calculating it; however, with this program that disadvantage is eliminated because the computer performs the computations using the figures you entered for NPV.

Using NPV/IRR

The figures produced by the NPV/IRR program are only as reliable as the data you enter. To get an accurate picture of the advisability of an investment project, you must carefully review all the figures you use. Because the NPV/IRR model incorporates only actual money receipts and payments, noncash income and expenditure should not enter into computations. So, if the yearly profits accruing from a warehouse are estimated, this figure cannot be used for computing the returns in the NPV model. Likewise, depreciation (not a cash expense) has to be added back to the profits to arrive at the cash benefits.

All "sunk" costs should also be excluded from the analysis. If, for example, the investors in the warehouse had commissioned a research study costing $30,000, it would be incorrect to consider this cost in the calculations. Even though the research is a cash investment, the $30,000 has already been paid and so has no bearing on assessing the proposal, since money spent on research cannot be recovered if the investor abandons the project.

For more details on investment planning using the NPV/IRR model, refer to *Survey of Accounting*, by Gary L. Schugart, et. al. (Houston, TX: Dame Publications, 1982), and *Principles of Financial Management* by Van Horne (Englewood Cliffs, NJ: Prentice-Hall, 1974). ■

See program listing on page 51

Address correspondence to Dev Chakravarty, c/o Marshall G. Rothen, Motorola Inc., 725 South Madison Drive, Tempe, AZ 85281.

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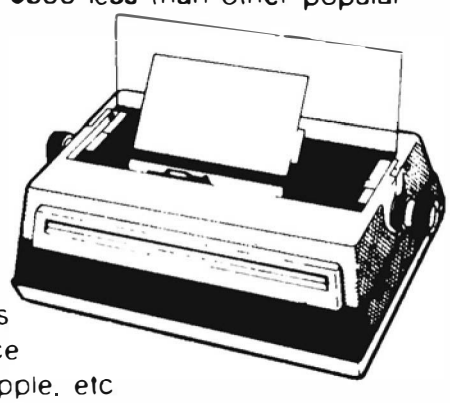

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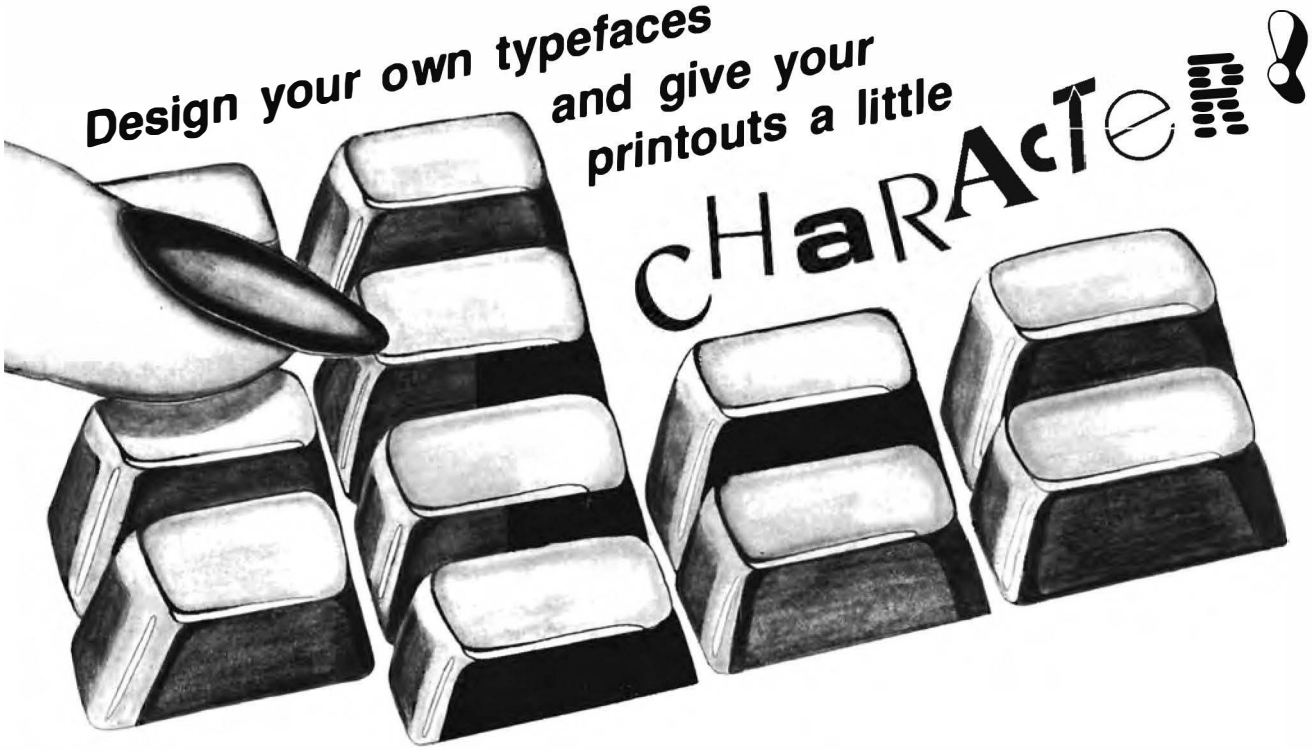


Illustration by Leonora A. Sullivan

The new printers for the Color Computer are very special because they allow creativity. With the Gemini-10X, for example, a downloadable character set lets you design 96 characters by programming the printer with a dot configuration for each character. I have written a Basic program to lay out the dot patterns, save them on disk or tape, and program the printer when you are ready to use them.

Encoding Dot Patterns

To understand how the program works, it helps to know how dot patterns are encoded for the Gemini. The print head consists of a vertical array of nine pins, or wires, used to make impressions on the print surface. You must program each pin to be on or off. Since all nine pins work at the same time, the printer needs to know the entire 9-pin configuration before you activate them.

The programmable character mode uses only seven of these pins to strike an impression—the top seven or the bottom seven. The bottom seven form the lower part of characters with descenders, such as p or g. Other letters, ascenders, use the top seven pins.

The character grid is seven rows high by nine columns wide. Each dot of the on/off pattern is represented as a binary digit, and the entire configuration is encoded as a 7-bit

number. The value of each row of dots from top to bottom is: 1, 2, 4, 8, 16, 32, and 64. To define all of the dots for a particular character, the program assigns a hexadecimal column value, equal to the sum of dot values in that column. Figure 1 shows a sample dot pattern for the letter A. Note that some dots are left out in row 4. The Gemini does not allow adjacent columns of any row to have consecutive dots.

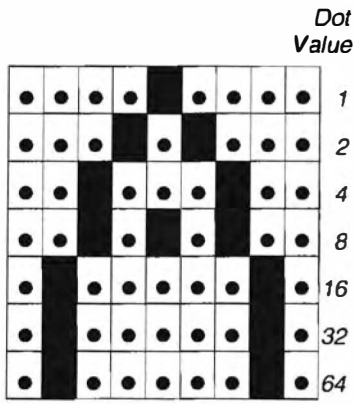


Fig. 1. Grid for the Letter A

Program Structure

Table 1 outlines the program structure. One feature of the program, the storage of character codes as 7-bit numbers and their retrieval as strings, deserves further discussion.

Line 20 reserves and protects a block of 960 bytes of memory using a CLEAR statement. This space is for the ascender/descender code and the nine binary dot codes for the 96-character set. Line 310 POKEs them into memory and line 280 retrieves them from the Gemini's RAM. You must transmit the codes as what I call numeric strings, e.g., CHR$(8), rather than in the ASCII form, 8. The most efficient way to do this is to redirect the Basic pointer for the string variable containing the code, A$, to the area of memory where the codes have been POKEd as 7-bit numbers. The VARPTR function returns the pointer to the string A$. POKEing location L, which contains the data belonging to A$, into the string pointer effectively fills A$ with the necessary data.

Running the Program

Type in the program exactly as listed. The spaces between elements are important for lining up the video display. As written, the program runs on disk. For tape, change lines 480 and 490 to CLOADM and CSAVEM, respectively. Run the program and the computer prompts you to turn on the printer. It then asks you for the baud rate. I run mine at 9,600 baud using a Blue Streak interface; the printer seems to keep up with the computer at this speed.

You can use a joystick or the keyboard to design your character set. If you select K, use the arrow keys to move the cursor. The menu offers you a variety of options:

- <S> et turns on the dot position shown by the cursor. It lets you design your characters at the screen.
- <R> eset turns off a dot that is on.
- <U> pdate stores the codes necessary to reproduce a character. Use update after you set the last dot in a character or if you wish to replace a character.
- <C> ls clears the screen.

Line #	Description
10–90	Set up
100–130	Compute cursor position if using keyboard
140–210	Option vectors
220	Test print character set
230–270	Program printer RAM
280–300	Update character
310	Direct keyboard entry of binary codes
320–370	Read screen and build binary codes
380	Display code hex value
390–440	View character stored in CoCo memory
450–470	Input ascenders/descenders, character, compute storage location
480–490	Read/Write data file
500–510	Get file name
520–540	Draw display
550	Baud-rate POKE values
560	PCLEAR

Table 1. Program Description

- <D> irect allows direct entry of the binary code to define a character.
- <Q> uit stops the program.
- <V> iew allows you to review previously updated characters. Here you can edit and save (by updating) the character. By viewing an E and deleting a few dots, you can make a new character and update it as F without losing the E.
- <P> rogram programs the Gemini with the current character set.
- <L> oad reads a character from disk/tape.
- <W> rite saves the current set to disk/tape.
- <T> est prints the current set. Type P before using this option.

Let's assume you have already entered and saved part of a character set and now wish to complete it. Select the load option from the menu. At the prompt, enter the name of the file containing the character set. An array filled with dots, indicating that all the pins are off, appears. The cursor marks the first dot position.

At this point you can view the characters already completed for possible editing or continue to define new characters. To define new characters, move the cursor to the dot position you want to set. Press S and a black square appears in that position and a hex digit is entered at the bottom of the column. If you make a mistake or wish to reset a dot, move the cursor to the correct place and press the R key. A dot (off) replaces the black square and the hex value is updated.

When you finish, press the U key. The program asks you if you have descenders. Type Y for yes, or N for no. Finally, to identify the character you have defined, enter the value of an ASCII character in hex (e.g., &H5F for the backspace arrow), or type the character after the prompt. Certain characters must be defined in hex, otherwise Basic misinterprets them. If, for example, you enter the back arrow as a character, Basic treats it as a backspace.

System Requirements
16K RAM
Extended Color Basic
Gemini-10X Printer

After the program accepts the character, the screen clears and you can define another character. Once you have entered the last character, it is wise to save the set using the write option. If the file already has a name, it will appear on the screen and pressing enter saves the set under the original file name. With a disk, the string need not include an extension, since the data is saved in binary and the DOS appends /BIN by default.

The direct-entry feature lets you bypass the set option. Instead, you enter the nine column sums from the keyboard. When prompted, respond with a decimal or hex value, preceding all hex values with &H. The program displays the character when the last column sum is entered and then prompts you for descenders and character entry.

Getting Started

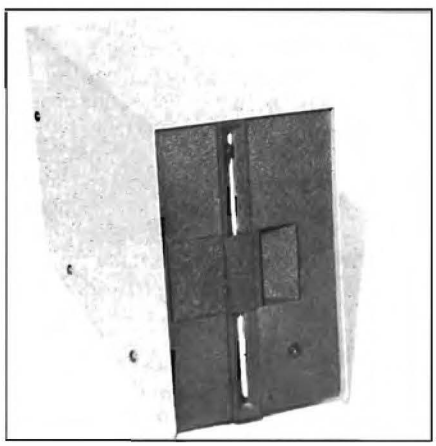
Now that you've keyed in the program and understand how it works, you're ready for the hard part: designing a character set. To get you off to a good start, I've prepared Table 2, which shows the hex column numbers for 26 uppercase, futuristic characters. I used the program to design these characters and then recorded them using a SAVEM command. Use the direct-entry option to enter them. But don't stop there. You've got a flexible printer that will let you put your creativity to the test, so have fun!■

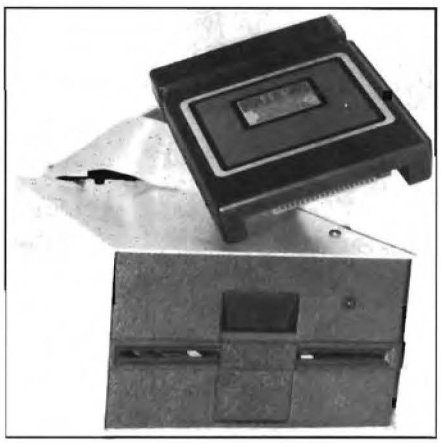
Character	Column								
	C0	C1	C2	C3	C4	C5	C6	C7	C8
A	78	00	76	09	00	09	06	78	00
B	7F	00	7F	00	49	14	47	70	00
C	7F	00	7F	00	41	02	41	22	00
D	7F	00	7F	00	41	00	41	3E	00
E	7F	00	7F	00	49	00	49	00	00
F	7F	00	7F	00	09	00	09	00	00
G	7F	00	7F	00	41	08	41	38	00
H	7F	00	77	08	00	08	00	7F	00
I	00	00	7D	00	7F	00	00	00	00
J	30	40	00	40	00	7F	00	7F	00
K	7F	00	74	0A	01	08	11	60	00
L	7F	00	7E	00	40	00	40	20	00
M	07	78	01	00	7E	00	01	7E	00
N	7F	00	7D	02	0C	30	00	7F	00
O	3C	42	3D	40	01	40	01	7E	00
P	7F	00	7F	00	09	00	09	06	00
Q	3C	42	3D	40	09	50	21	5E	00
R	7F	00	7F	00	09	10	29	46	00
S	46	09	40	09	70	09	32	00	00
T	00	01	7C	01	7E	01	00	03	00
U	3F	40	00	40	00	7F	00	7F	00
V	1F	00	1E	20	40	20	10	0F	00
W	07	78	40	3F	40	00	40	3F	00
X	01	66	14	08	00	6B	14	63	00
Y	01	06	04	08	70	0F	00	0F	00
Z	41	20	51	28	55	0A	45	00	00

Table 2. Futuristic Character Set

See program listing on page 52

Fabulous Fonts is available on the Instant CoCo cassette (see p. 64 for details). However, the author will provide the program and any new fonts he's created for $6 and a disk or cassette with a double-stamped, self-addressed mailer. Write to Peter Stoloff, 9203 Custer Terrace, Adelphi, MD 20783.





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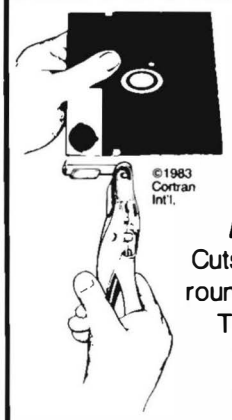

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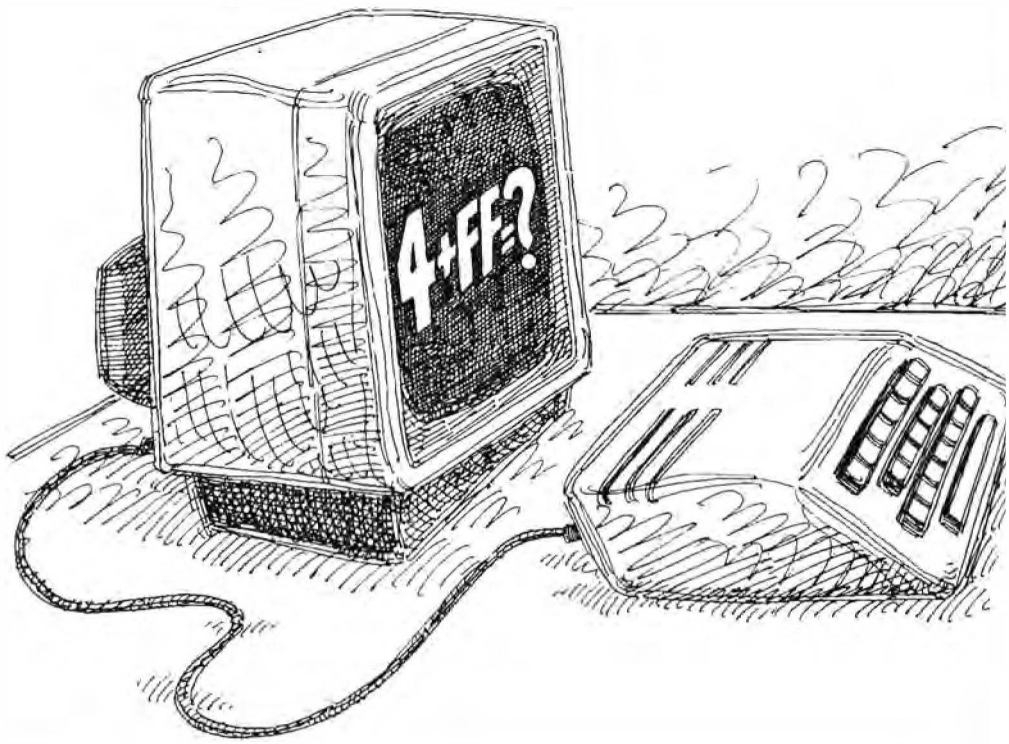

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OR and AND

Binary OR and AND are logical operations that compare two values bit for bit. The outcome of OR is true (i.e., equal to one) if at least one of the inputs is true. This means that OR is false (i.e., equal to zero) only when both inputs are false. In contrast, the outcome of AND is true only if both inputs are true. The logic diagrams in Table 1 show all possible outcomes of OR and AND when there are two inputs.

Binary and Hexadecimal Addition

Binary addition is easy to learn, but because you work with only zero and one, you have to make carries much more frequently in binary addition than in decimal addition. Two simple rules make carrying out to the next place easy:

1 + 1 = 0 with a carry out of 1
1 + 1 + 1 = 1 with a carry out of 1

As in the decimal system, you work binary addition from right to left.

Hexadecimal notation uses the decimal digits zero through nine and letters A through F. Adding hexadecimal numbers is more difficult than adding binary numbers, so don't feel guilty about using Table 2 as a crib sheet. It contains the results for 0 + 0 to F + F, but remember to carry a one out to the next place when the sum of two digits is more than the value of F.

OR	0	1
0	0	1
1	1	1

AND	0	1
0	0	0
1	0	1

Table 1. Binary OR and Binary AND

System Requirements
CoCo or MC-10
4K RAM
Color Basic or
Micro Color Basic

Running the Programs

Listing 1 is for binary OR. By making simple modifications in this program, you can

Illustration by Peter Bono

use it to practice binary AND and binary addition. Be sure to save each version of the program you'd like to go back to later.

Enter and run Listing 1. A problem appears at the top of the screen. When you submit an answer, the program tells you whether you are right or wrong. If the answer is wrong, you must try the problem again. When you want to practice AND, press break to stop the program. Then make the following line changes to Listing 1:

```
30   PRINT@10,"BINARY AND"
210  PRINT@97,"AND";
390  IF A < > (H1 AND H2)GOTO420
```

Enter and run this new listing and save a copy to tape if you want. To advance to practice with binary addition, repeat the above procedure, this time making these line changes:

```
30   PRINT@8,"BINARY ADDITION"
40   H1 = RND(128) – 1:H2 = RND(128) – 1
210  PRINT@99," + ";
390  IF A < > (H1 + H2)GOTO420
```

For the problems in hexadecimal addition, type in Listing 2 and run it. The program will accept inputs other than hexadecimal, so be careful. ■

See program listing on page 52

Address correspondence to: Frank Tipps, 1837 Cartlen Drive, Placentia, CA 92670.

+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
1	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	0
2	2	3	4	5	6	7	8	9	A	B	C	D	E	F	0	1
3	3	4	5	6	7	8	9	A	B	C	D	E	F	0	1	2
4	4	5	6	7	8	9	A	B	C	D	E	F	0	1	2	3
5	5	6	7	8	9	A	B	C	D	E	F	0	1	2	3	4
6	6	7	8	9	A	B	C	D	E	F	0	1	2	3	4	5
7	7	8	9	A	B	C	D	E	F	0	1	2	3	4	5	6
8	8	9	A	B	C	D	E	F	0	1	2	3	4	5	6	7
9	9	A	B	C	D	E	F	0	1	2	3	4	5	6	7	8
A	A	B	C	D	E	F	0	1	2	3	4	5	6	7	8	9
B	B	C	D	E	F	0	1	2	3	4	5	6	7	8	9	A
C	C	D	E	F	0	1	2	3	4	5	6	7	8	9	A	B
D	D	E	F	0	1	2	3	4	5	6	7	8	9	A	B	C
E	E	F	0	1	2	3	4	5	6	7	8	9	A	B	C	D
F	F	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E

Table 2. Hexadecimal Addition

Continued from p. 39

made. It uses high-quality parts and its workmanship is first rate. The circuit board is made of a heavy-duty material. The pins that connect it to the original socket look more like nails than pins and so are unlikely to create a faulty connection. Installing the Dual DOS Card is easy. Follow the instructions that come with it. Take the four screws out of your J&M Disk Controller's case and set the top aside. Remove the chip marked U6 and plug it into the Dual DOS Card. Plug your other ROM or EPROM into the remaining socket on Dual DOS. Then plug the new card into the empty socket left by the U6 chip on the controller board. The final touch is installing the switch on the cover of the controller's case.

For some configurations you have to cut a trace and solder a jumper on the underside of the board. This is not a difficult procedure, but it requires tools and confidence. Dual DOS Card's instructions show you where to scrape through the trace with a sharp blade. You can use any soldering iron and thin solder to make the jumper.

Documentation

Dual DOS's instructions, including diagrams of the card, are printed on both sides of a single sheet of paper. They are adequate if you have installed ICs before, but come without important information that a novice might need. The directions explain the switch settings, cover the installation of various configurations, and take you through cutting traces and soldering jumpers. But they refer to pin-numbers without ever providing a pin-out diagram or explanation of pin-number locations. This information is critical to the proper installation of Dual DOS, and its absence could lead to damage of your equipment. The following explains the pin numbering.

Both the socket and chip have a white dot or carved notch at one end. You match the dot or notch on the chip with the dot or notch on the socket when you connect them. To determine pin number 1, hold the chip with the dot or notch end up. Pin number 1 is the one closest to the notch or dot on the left side, and the numbers run counterclockwise around the chip.

Performance

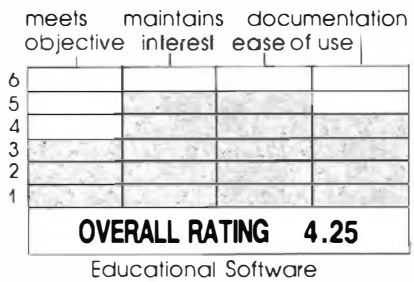
Once you have Dual DOS Card installed, its operation is simple. To go from one ROM to the other, you just flip the switch. Setting the switch in the center position reverts the computer back to Extended Color Basic. The only drawback is that you can't make a switch from software because switching DOSes forces the computer through a cold start for resetting pointers. Because of the cold start, you lose whatever is in memory.

Dual DOS operates flawlessly. If you take advantage of everything it offers, it will give your computing a whole new flavor. RGS Micro had the JDOS controller in mind when creating Dual DOS Card, and J&M's product works very well with it. The card will probably work with controllers manufactured by other companies, too. Dual DOS also works with other DOSes on a ROM or EPROM chip that you plug into the controller. The ability to have different DOSes available for different applications, including, perhaps, a DOS tailored to suit your specific needs, gives the CoCo a versatility that will spoil you.■

The Dual DOS Card is manufactured by RGS Micro Inc., Main St., Derby Line, VT 05830, 800-361-4970. It works with any Color Computer but requires a third-party disk controller, such as J&M's JDOS controller. Dual DOS Card sells for $19.95 plus $4 for shipping.

Typing with Zookey

by Dennis W. Peterson



Educational Software

Zookey is a typing tutorial and a game that is a great deal of fun to play. If you put on your halo and follow the simple directions, Zookey could be instrumental in teaching you how to type. But some of the game's built-in temptations could work against good typing instruction. Learning with Zookey depends on the willpower of the user.

Zookey's screen is divided into eight columns, each of which has a caged animal at its top. The program displays letters, numbers, or symbols along the bottom of the screen. In the middle of the screen there is a trap door through which the animals at the top try to escape on a random basis. You stop them from escaping by pressing the key that corresponds to the letter, number, or symbol at the bottom. If you press the correct character in time, a little zookeeper rushes to the trap door and locks it. If you don't press the right key in time, the animal gets away. The game ends if five animals escape.

Zookey lets you choose the kinds of characters that appear at the bottom of the screen. You might want to work on numbers instead of letters, for example. The tutorial also lets you choose speed and skill levels. You can make selections for each of these categories on a scale of 1 to 8. If you choose 1 for both categories, Zookey is a mild typing-tutorial game. Selecting 8 for both categories makes even skilled typists wonder about their abilities. The speed category determines how fast the animals descend to the trap door. The skill category controls the number of animals that descend (almost simultaneously in the higher levels).

Zookey's directions are clear and include a typist's diagram for the CoCo keyboard. The diagram and directions make it easy to figure out the proper key fingerings. As a game, Zookey's concept becomes apparent quickly. It is easy to use. Although the documentation does not mention it, pressing the enter key pauses the game. Pressing it again restarts the game. Zookey commands a high interest level. It is fun, even if you don't want to learn to type.

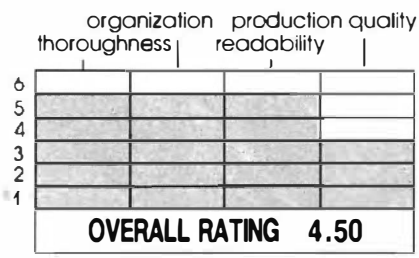
Zookey could be improved by having an elementary screen in which each of the eight columns corresponds to a finger to help young and new typists with finger control. Zookey would also gain by being able to download through a Network II controller, making it a viable classroom supplement.

Does Zookey teach typing? Not if you select a skill or speed level that is too high. At high levels, many people will be given to random key mashing just to raise the score. But if you are the kind of person who reads the directions and sticks to them, you could learn a great deal about using a keyboard from this program. Zookey relies on a responsible attitude on the part of students using it in order to teach typing. But at worst, students will gain a better understanding of the CoCo's keyboard. Those who apply themselves will learn to type. And Zookey is entertaining for all.■

Zookey is manufactured by Mark Data Products, 24001 Alicia Parkway, No. 207, Mission Viejo, CA 92691. 714-768-1551. It requires 16K and sells for $24.95 on cassette and $27.95 on disk, plus $2 for shipping.

Remarkable *CoCo Logo*

by Richard Ramella



Books

You could say that *CoCo Logo* by Dale Peterson, Don Inman, and Ramon Zamora is a series of letters about the life of Uncle Bert Woofensburger, a Michigan pig farmer, written to his niece Molly. But then it doesn't sound like an educational computer book, does it? That's the charm of *CoCo Logo*. It takes a whimsical approach to teaching Logo that doesn't overpower its ability to educate. And it manages to cover much of what there is to know about Radio Shack's Color Logo. For example, its folksy chapter beginnings about turtles under the house, visits to the fair, and eating spaghetti are amusing, but they also correlate with the information in the chapters and help teach readers how to program in Color Logo.

CoCo Logo is the best of five books I've seen on the topic of Color Logo. The original Uncle Bert letters were published by *The Rainbow*. They have been reedited, footnoted, and reorganized in a sequence that describes the use of Color Logo in a logical fashion.

The format of the book makes it enjoyable and easy to read. Uncle Bert is no computer genius. In fact, at the start he is just as puzzled about Logo as any beginner. But he makes clever mistakes in an often delightfully tongue-in-cheek manner. Uncle Bert is a reassuring character because he offers the wisdom of age, a friendly willingness to admit error, and the encouragemnet to keep trying. And even though Uncle Bert lives in a rustic setting, he is no hayseed. He's apt to break into Latin or cite arcane facts—the kind of material that kids skip over easily and adults often enjoy.

CoCo Logo deals out Color Logo in small bites with follow-along instructions. One of the teachings of the book is that Logo is a debugging process. What is right for one person might be wrong for another. The programmmer's aim should be to get the program to carry out the plan.

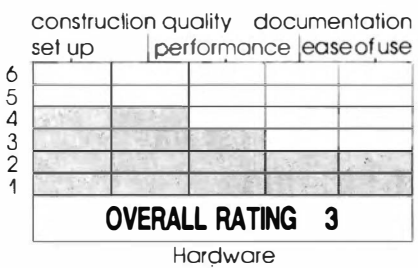
The first chapter tells how to set up your system and get the program to run. Bert is mildy puzzled but manages to make the Logo turtle perform a few rudimentary travels, draw a doghouse, and learn for himself the different operating modes: break, edit, run, and doodle. In some of the later chapters I found new understanding and new ways to use Logo capabilities.

The beauty of *CoCo Logo* is its pace. Interested children as young as eight or nine will be able to follow the text. The authors are aware that Logo was not designed as a predetermined set of procedures to which all must adhere, but as a discovery process for the learner that can go in many directions by fostering understanding and new ideas about Logo. ■

CoCo Logo *was written by Dale Peterson, Don Inman, and Ramon Zamora and published by John Wiley & Sons, New York, NY, 1985, softcover, 127 pp., $12.95.*

Sounding Out Tandy's Sound/Speech Cartridge

by Gary W. Clemens



Hardware

The Sound/Speech Cartridge is Radio Shack's entry into the talking-CoCo craze. It is a ROM-pack device based on General Instrument's PIC 7040-510 System Software. Its microprocessor controls separate speech and sound generators and routing of sound through the CoCo to the TV output. It has text-to-speech capability, can play three-part musical harmony, and create complex sound effects.

The Sound/Speech Cartridge is designed for use with game, education, and other applications; it is also programmable. It has 16 sound and speech storage buffers (eight of each), which provide space for eight 64-byte sound effects and eight 64-character sentences. The Cartridge also offers three voices in a nine-octave range.

The Sound/Speech Cartridge works with disk, cassette, and ROM-pack programs, but disk and ROM-pack users need a Y cable or a multiple ROM-pack interface. It is compatible with JDOS as well as Disk Extended Color Basic.

You generate speech with this synthesizer by preprogramming "allophones," small units of speech (sounds or syllables) that you store as hex or decimal codes in the buffers. You generate sound effects by modifying the built-in commands to redefine the channel, amplitude, pitch, and duration or by manipulating the Cartridge's registers.

Performance

The speech function of this synthesizer sounds mechanical, lacking the timbre and inflection that we are accustomed to hearing in human speech. But the product is a step above the speech imitation attempt of commercial software and about on par with the Votrax chip used in some other voice synthesziers.

Speech-generation firmware has limitations, however. Even with the 59 allophones the Sound/Speech Cartridge offers, it is difficult to generate many words. I found that discovering how best to program a word is very often a matter of trial and error, despite the theory that if an allophone table is complete, proper combinations of allophones can reproduce any word in the English language.

Before I received this product, I anticipated it to be an ideal device for speech-handicapped individuals. But the need for users to alter spellings of so many words could be too great a shortcoming for that application. What is lacking is software designed to translate keyboard entries so the Cartridge can interpret them in a way that correctly imitates human speech.

The musical sounds that the Sound/Speech Cartridge produces do not mimic the sounds of musical instruments, but they can reproduce recognizable melodies. The Cartridge creates a purer tone than you can accomplish with Basic's SOUND command. But some commercial machine-language software produces musical sounds that are as good or better.

The Sound/Speech Cartridge lacks many of the components necessary to create musical scores. Its most complex chords have only three notes, and you can't generate simultaneous chords and harmony. There is also no easy way to create echo and reverberation, standard functions of many music synthesizers.

What the Sound/Speech Cartridge can do is produce sound effects. All of the pops, whistles, explosions, gunshots, and other noises commonly used in games are not only possible but in many cases sound much better than their software-created counterparts.

The Sound/Speech Cartridge from Radio Shack

Documentation

The Sound/Speech Cartridge comes with a comprehensive 56-page manual that includes sections on programming text to speech, us-

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ing allophones, programming sounds, shaping sound envelopes, and gaining direct access to the registers. It also has eight appendices, including one on sound-generator registers, a command-instruction map, allophone address tables, the chromatic scale, and several demonstration programs.

As a result of this battery of information, the manual is, at best, very technical. Nonprogrammers will probably find the reading to be heavy going. Most of the manual's sections were written for programmers who have a good understanding of machine language. The sections dealing with sound and music are probably the most inaccessible. There is little information that uses musical notation, so having a music background won't help.

To make the Sound/Speech Cartridge produce sound effects or music, you enter a command that loads one or more buffers and follows by data groups of 3 or 4 postbytes. Each data group defines a tone, noise, or envelope. The manual has postbyte tables for each sound quality. They chart definitions for the bytes belonging to each postbyte of the various sound qualities. None of these terms are defined, however. Nor are there step-by-step explanations to help novices get started. The manual presumes that you already have a good understanding of the terms it uses.

Nontechnical users will probably have the most success with the demonstration programs. One of them, for example, allows the CoCo to emulate an organ that can play 16 notes beginning with the A above middle C. Another "speaks" whatever you type into the computer, but it has a limited usefulness. Some of its words are fairly distinct, but others are unintelligible. To overcome this you have to misspell many words, which could encourage poor spelling, especially among children.

Ease of Use

Some of the Sound/Speech Cartridge demonstration programs that accept keyboard input are easy to use because pressing the correct key provides almost immediate results. But programming sound or speech is a difficult matter. You must type each syllable or unit of sound and its associated qualities into DATA statements byte by byte. Even programmers who are comfortably familiar with the terminology the manual uses will have to go through a trial-and-error process, sorting through combinations of sound or speech units to obtain the results they desire.

Set Up and Construction

Setting up the Sound/Speech Cartridge is as easy as plugging in a ROM pack and typing in one of the programs from the instruction manual. If you are using a monitor, your CoCo must have an audio output because the Cartridge does not have a speaker. Disk users who have Radio Shack's Multi-Pak Interface may put the Cartridge in any slot other than slot four.

The Sound/Speech Cartridge is well constructed and has a heavy plastic housing. The power contact strip on its edge-connector card is shorter than the other contacts to reduce the risk of burning out your cartridge or computer if you forget to turn off the power before inserting the ROM pack. One feature found on most ROM packs and missing from the Cartridge is a sliding door for covering the contacts when it is not in use.

Summary

The Sound/Speech Cartridge can generate speech, a wide variety of sounds, and enhance game and education programs. But it requires perseverence and programming effort. If used by speech-handicapped individ-

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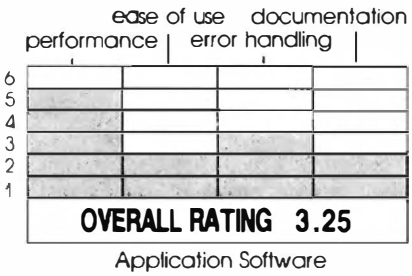
uals in conjunction with software that is as yet unavailable, it has the potential to be a valuable aid.

Because it is difficult to understand the Cartridge's monotone speech in phrases that are longer than a few words, it is unlikely that the Sound/Speech Cartridge could perform well as a talking tutor in its present form. It could, however, be useful for some applications, such as brief program instructions and menu selections. Although the Sound/Speech Cartridge has some advantages, it is also expensive. You might want to investigate and compare other synthesizer products for the CoCo before making a purchasing decision. ■

The Sound/Speech Cartridge is manufactured by Tandy Corp. (Catalog No. 26-3144), 1400 One Tandy Center, Fort Worth, TX 76102. It requires 16K and runs with cassette or disk. It sells for $99.95.

T/S Edit to a T

by Jeffrey S. Parker



How often have you wished you could write a simple text file without getting dizzy from the checkerboards? How many times have you sat in front of your CoCo wishing it had an easy-to-live-with editor? Are you an OS-9 user who still can't believe the system doesn't include lowercase characters? Are you using a macro text editor that is not providing what you need?

T/S Edit might be for you. This is one of the most sophisticated disk-based utilities to come along since OS-9's introduction. T/S Edit is a text/screen editor that edits program lines as well as text files. It incorporates 10 choices for screen-display size and four choices for screen-display colors. The program comes fully equipped with a lowercase letter display with true descenders and file-merging capability. It can also simulate an 80-column display with horizontal scrolling.

T/S Edit might be intimidating at first. Because it can handle OS-9 and Radio Shack DOS, it has several options for loading and running. T/S Edit's operating commands are

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almost identical within the two DOSes. The only differences come into play when you are reconfiguring the program's default parameters. You change Radio Shack DOS parameters by editing Basic program lines; in OS-9 you rewrite a default parameters file.

Once you have learned its commands, T/S Edit is a very effective and versatile text editor. Becoming comfortable with the program's commands, however, can be somewhat difficult. T/S Edit uses a series of one-and two-key commands. One difficulty with following the command sequences is that the program requires you to use upper- and lowercase letters that have different meanings. This can cause some confusion. You might find yourself chasing the cursor around the screen at first until you memorize the key combinations you need.

T/S Edit has options for screen color and display format that you can change at any point in the editing process. I found black characters on a green background in the 40-column by 24-line display mode to be the best format in which to work. These are the only parameters that you can change during the actual editing process; you have to change all others, such as printer baud rate, before entering the editor.

T/S Edit offers several powerful features, including global search and replace, "yank" (which lets you copy text to another place in the file without erasing the original), and undo features. It also has a feature for stacking files in the edit buffer, which lets you select several files in advance and edit them one at a time. Once you accomplish an editing task, T/S Edit rewrites all the changes to the file under the original name.

A nice feature of the OS-9 version of T/SEdit is that you can call a shell command from the edit mode, meaning that you can access a directory, for example, from the editor and return to the editing process immediately following the execution of the command. And you can exit the editor and enter OS-9 by using just one command.

T/S Edit comes with a well-organized, 33-page manual. It is arranged in a logical order, covering everything from loading the program and its editing commands to a glossary of keyboard codes and a summary by function of all T/S Edit commands. The complexity and variety of these commands make it important to read all sections of the manual for a full understanding of command usage. I strongly recommend that users practice the commands. Although the documentation covers everything, it skimps on examples of usage. It expects its readers to bring some understanding of text editors with them. Once you have a working knowledge of the program's editing commands, the "quick reference guide" that comes with the documentation is very helpful.

T/S Edit is a powerful and sophisticated text-handling program. It has all the features you need and some added options for more serious editing. Its ability to run on OS-9 and Radio Shack DOS makes it a good investment for OS-9 users. And despite a lack of explanatory examples, its documentation is well organized and generally thorough. The program's extra features—high resolution, upper- and lowercase display, and horizontal scrolling—make it a bargain and go a long way in contributing to its overall ease of use and performance. I recommend T/S Edit to anyone who doesn't mind spending a little time getting to know how to use it. ■

T/S Edit is manufactured by Tandy Corp. (Catalog No. 26-3264), 1400 One Tandy Center, Fort Worth, TX 76102. The program requires a disk drive, 32K for Radio Shack DOS, and 64K for OS-9. It sells for $34.95.

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6809 on Line

by Bobby Ballard

A Buffer for Videotex

From the letters you write and the questions I see on BBSes, many people are still trying to find the save and print features for Videotex, a terminal program from Radio Shack that only supports reading data on screen.

Ironically, the Videotex manual states that it stores the "last 31 pages in the text buffer." That's great, unless you want to use the information another day or load and run it as a program. There is no save-to-tape or line-printer feature, and apparently many of you would like a solution to this problem.

Bufftext (see Program Listing), which examines RAM and lets you copy most of your Videotex buffer to tape or paper, is that solution. Notice I said most of your buffer. You copy RAM to screen, tape, or printer and resave it in ASCII format. You lose some of the first pages you download to Bufftext, so keep your Bufftext files short to avoid overwriting any more buffer space than necessary.

Written for 16K Extended Color Basic, Bufftext runs on 32K and 64K as well and can be modified to run on nonextended machines. If you have more than 16K, change the value of ER in line 30 to &H7FFF.

Type in the program, and save it to tape as Bufftext. Then disable the ROM-pack autostart on Videotex by holding the ROM pack with the sliding door facing you and the edge connector pointed toward the ceiling. Slide the door down to reveal 14 metal strips. The first strip on the left is the cartridge-interrupt line. Place a piece of masking tape over this connection only. With your CoCo's power off, plug in the modified ROM pack. When you turn on the power, you should see the normal sign-on for Basic. If you don't, go back and check to make sure the tape is in the correct place and holding. Caution: Never insert or remove a ROM pack with the CoCo turned on.

Next, type EXEC 49152 and press the enter key followed by the break key. You will be greeted with Videotex's "Place Call" prompt. Follow normal procedure for Videotex and the services you call. Bufftext writes over some of RAM during loading. When you end your call and save the buffer, you reinitialize and Basic writes over certain sections of memory. So it is a good idea to download important information more than once, giving yourself several copies "stacked" in memory. With multiple copies, you can edit to get a complete document.

End your phone session as usual and get ready to save your work. First, press the reset button on the back of the computer. The Basic header appears again, but don't worry. RAM still contains most of your buffer. Make sure a tape is loaded and ready to record. Save all of RAM by typing CSAVEM "name," 1536, 16383, 1536, and pressing enter. Change 16383 to 32767 for 32 and 64K machines. Make several copies and put them aside. (At this point, you have the option of shutting off the power and removing the ROM pack.)

Perform a PCLEAR0 by typing POKE 25,6:NEW. This reserves all avallable RAM for program and buffer use. Load the tape you saved after going off line by typing CLOADM "name" and pressing enter. When you are greeted with Basic's OK prompt, load Bufftext and run it. You'll see the title on your screen. Press any key to continue.

Bufftext works by PEEKing memory locations, checking for ASCII code (line 1000) and POKEing an ASCII value to the screen. The menu at the bottom of the screen lets you continue print (CP) or save (S) part of the buffer. The C command puts the next text page on the screen. You may continue to scroll through memory in this fashion. The text page (TP) value at the bottom indicates the text page you are viewing.

You may print any text that appears on your screen by selecting P at the prompt. Make sure your printer is on or the program will hang up. To save information to tape, give page numbers, corresponding to the TP you wish to save, at the prompts. Bufftext then prompts you for a file name, which must fit Basic standards (e.g., eight characters). When you see the title screen again, Bufftext is done.

That's it! The tape you saved using Bufftext is in ASCII format and you can load it into any other software that supports ASCII input from tape. You can, for example, load this tape into Color Scripsit for editing, formatting, printing, and resaving.

You'll find Bufftext useful for PEEKing or printing RAM in ASCII format even if you don't own a copy of Videotex. Most important, using Bufftext with Videotex lets you capture information that some fancy software protocols won't capture. Feel free to modify and improve the program. I'd love to hear about your fixes, ideas, or solutions for using Videotex and Bufftext, or about any other experience you've had telecommunicating with your CoCo. ■

This program is available on our Instant CoCo cassette.

```
5 'BUFFTEXT(C)'85 BOBBY BALLARD
10 'SR=START OF RAM,ER=END RAM,S
P=SCREEN POSITION
20 'PV=PRINTER ASCII VALUE,CC=CH
ARACTER COUNT
30 SR=&H600:ER=&H3FFF:TP=0
40 CLS:PRINT@43,"buff-tex
50 R$=INKEY$:IF R$="" THEN 50
60 FOR SP=1024 TO 1503 STEP 1
70 POKE SP,PEEK(SR):POKE SP+1,&H
7E
80 SR=SR+1:NEXT SP:TP=TP+1
90 PRINT@482,"   cONT pRINT sAVE
   TP="TP;
100 R$=INKEY$:IF R$="" THEN 100
110 IF R$="C"THEN CLS:GOTO 60
120 IF R$="P"THEN GOSUB 510
130 IF R$="S" THEN GOSUB 610
140 GOTO 90
500 'PRINT TO PAPER
510 FOR SP=1024 TO 1503 STEP 32:
FOR CC=0 TO 31
520 P=PEEK(SP+CC) AND 127:GOSUB
1000
530 PRINT#-2,CHR$(P);:NEXT CC:PR
INT#-2:NEXT SP
540 RETURN
600 'ASCII SAVE TO TAPE
610 CLS:LINEINPUT"  STARTING PAG
E # ";S$
620 LINEINPUT"  ENDING PAGE # ";
E$
630 LINEINPUT"  FILENAME (8): ";
F$
640 PRINT@325,"READY TAPE-PRESS
ENTER"
650 R$=INKEY$:IF R$="" THEN650
660 CLS:PRINT@45,"saving":PRINT@
172,F$
670 PS=VAL(S$):PE=VAL(E$):MS=153
6+((PS-1)*480)
680 IF PE=1 THEN ME=2015 ELSE ME
=2015+(PE*480)
690 X=0:Y=0
700 OPEN"O",#-1,F$
710 Y=0:MS=MS+X:X=0:SV$="":FOR L
=MS TO MS+31:X=X+1
720 P=PEEK(L):GOSUB 1000:SV$=SV$
+CHR$(P):NEXT L
730 PRINT#-1,SV$:Y=MS+X:IF Y=<ME
 THEN 710 ELSE 740
740 CLOSE#-1
750 GOTO30
1000 IF P>95 THEN P=P-64 ELSE IF
 P<=31 THEN P=32
1010 RETURN
```

Program Listing 1. Bufftext

System Requirements

16K RAM
Extended Color Basic
Videotex

Address correspondence to Bobby Ballard, 1207 Eighth Ave. 4 R, Brooklyn, NY 11215.

Assembly 101

by Victor and James Perotti

What's in a Program?

Okay, let's get the big picture. The 6809 CPU can read and process only binary machine code. An assembler is a piece of software that converts (assembles) a text program file into machine code. There are three steps involved with Assembly language:

- writing an Assembly program in an ASCII editor;
- assembling or compiling the text program into binary machine code; and
- running or executing the binary program.

Writing Assembly language will not be like writing Basic; the assembler has a built-in editor that checks the syntax of each line as you enter it. When you are ready to run a Basic program, the syntax errors have all been fixed. With an assembler, there is no error checking in the editor; errors are flagged as the text program is assembled. When you make a mistake programming in any language, the program does not do what you expected. When machine coded or binary programs go astray, however, they usually crash the computer.

Assembler software typically consists of three essential parts:

- the editor in which an Assembly-language program is written;
- the assembler that assembles, or converts, the Assembly-language program into machine code; and
- a debug or monitor program that displays sections of memory, thereby displaying errors for debugging.

What Is in a Program

When you use a calculator, you must supply data and instructions. When you use a computer, you enter the data and instructions into memory. The CPU must know where to find the instructions and the data; hence, it must also keep track of the addresses that it uses:

ADDR	CODE	INSTR	
0600	86	LDA	1ST INSTRUCTION
0601	60	#$60	DATA
0602	B7	STA	2ND INSTRUCTION
0603	04	$04	ADDRESS IN 2 PARTS
0604	00	00	ADDR = $0400
0605	3F	SWI	3RD INSTRUCTION

This short example, all in hex, loads accumulator A with the ASCII data for a blank and stores the contents of A at address $0400 (the top of the screen), and ends. The example is a listing of a program that is already compiled. The assembler has assigned addresses for each byte of code; it has converted the text (e.g., LDA #$60) into binary numeric representations readable by the CPU. Assemblers that store programs on tape usually locate the binary code at $600; this program is located at $600 to $605. When the programs are stored on disk, the code usually begins at $E00.

The second column above shows the results of converting the text into binary code; do not be confused by the fact that the binary has been translated into hexadecimal. Everything in the computer is really binary ones and zeros; the hex is only a way to help us poor humans better read the contents of memory. It is much easier for us to process hex 86 than binary 10000110, which is 134 in decimal (I looked it all up).

When the 6809 processes 10000110 at memory location $600, it understands that it is supposed to load accumulator A (LDA) and move to the next byte in memory, $601, to find the data to be loaded. Similarly, in $602 the CPU finds and processes a second instruction: store accumulator A (STA). $603 and $604 contain the address at which the contents of A are to be stored. The 6809 takes the two parts of the address, $04 and $00, and treats them as a 16-bit address. Finally, the SWI instruction ends the execution of this little program.

The First Little Program

Now we'll show you how to write a small program in the editor, assemble it, and run it. The program will put a line on the screen, so you can easily tell whether or not the program worked. Again, think of the screen as a block of memory, $0400 to $0600. Whatever you store there will be printed on the screen. The Color Computer screen displays 16 lines of text; thinking in hex, the lines begin with $400, $420, $440, $480, and so on.

Type the following program into the editor. If you are using EDTASM +, omit the first line (START NAM LINE); change END in the last line to SWI; and add a final line, END (typed under the second column).

```
START   NAM   LINE
INIT    LDA   #128    *128 IS BLACK BLOCK
        LDB   #32     *COUNTS 32 CHRS PER LINE
        LDX   #$480   *POINTS TO START OF 4TH LINE
LOOP    STA   ,X+     *PUTS BLOCK ON SCREEN LINE
        DECB          *DECREMENT B BY 1
        BNE   LOOP    *IF B NOT YET ZERO, LOOP
DONE    END           *RESET PC TO START OF PGRM
```

Putting a Black Line on the Screen

This program prints CHR$(128), a black blob, 32 times, making a black line across the screen. Accumulator A will load and then store the black blob. Accumulator B will be used to count from 32 to zero, so that a full line (32 characters) of blobs will be displayed. The X register will point to the address in screen memory, $480 or the fourth line down, where the blob will be stored. Therefore, we use LDA #128, LDB #32, and LDX #$480.

With those registers loaded, the STA ,X + translates into an instruction to put the blob in A at the address in X ($480); the plus sign

continued on page 83

System Requirements

16K RAM
Color Basic
Editor/Assembler

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Reader's Forum

Border Pizzazz

Program Listing 1, Border Pizzazz, prints a moving border for the title pages of your programs. The short, 12-line program uses a fast machine-language routine to perform the task. The machine-language part is written in position-independent code so you can store it anywhere in memory.

Be sure to change the CLEAR statement if you change the starting address. The delay loop in line 70 controls the moving rate of the border. Change this if you want to alter the speed at which the border moves. The DATA statement in line 110 contains the graphics block characters ASCII value used to make the border. Change the first three values (not the BF) to a different hex number and a new style border is printed. Astute watchers will notice an optical illusion is produced. Look closely at the border and see if it appears to change directions. Feel free to use the border in any of your own programs.

Jack Shaffer
Oakwood, IL

Better Colors

I was disapointed to discover that when using high-resolution graphics with my F version CoCo, colors that should have been been blue came out a frosty green. A look at the color modulator circuit showed that Radio Shack had installed a capacitor, inductor, and 33K resistor from the clock signal to the emitter from the video amplifier transistor, Q3, in an attempt to bypass some clock signal into the video signal.

The circuit was not working well because no signal was being injected into the very-low-impedence emitter of the transistor. The reason that the circuit worked at all was that the junction of the resistor and inductor was physically close to the base circuitry of the transistor, and the signal was being capacitively coupled into the base. This was critical as to the dress of the components and I couldn't obtain a satisfactory result except when I was holding the parts with my hand.

The circuit was necessary because Motorola chose not to generate any color burst from the VDG in the black-and-white displays. Thus PMODE 4, color set 1 and PMODE 2, color set 1 might have color burst that makes it possible to create predetermined colors with most television sets and composite video monitors.

The junction of R44, R45, and R47 is a convenient place to inject this clock signal, because it it a low-impedence point and the leg of the pot is easy to solder to. (See Fig. 1.) I discarded the capacitor and inductor, because they seemed to serve no useful purpose, and attached the 33K resistor, with its leads cut short, to the clock signal at the post to the left of U6. By running a short length of #26 wire from the 33K resistor to the left leg of the pot, I had a stable circuit, insensitive to lead dress. The 33K resistor just happened to be the right value. Other sets might require slightly more or less, but one should be careful not to inject so much clock that the normal colors are affected.

With this circuit I get bright reds and blues.

Fred B. Tinker
Beaverton, OR

Memory Upgrade Trick

If you have ever tried either the 64K upgrade or the inverse-video modification, then you know that you have to mutilate the 74LS02 and 74LS138 or the VDG to achieve them. If you're careful, and lucky, the IC pins bend up and out of the way just fine. Unfortunately, when I made the changes, the pins on the 74LS02 and

```
10 CLEAR200,15000:CLS
20 FORX=15000TO15103
30 READOP$:N=VAL("&H"+OP$)
40 POKEX,N:S=S+N:NEXT
60 PRINT@169,"BORDER PIZZAZZ";:P
RINT@238,"BY";:PRINT@298,"JACK S
HAFFER";
70 EXEC15000:FORX=1TO75:NEXT:GOT
O70
80 DATA 31,8D,00,5F,1F,21,E6,8D,
00,5D,3A,1F,12,8E,04,00,A6,A0,A7
,80,8D,44,8C,04,20,26,F5,8E,04,3
F,A6,A0
90 DATA A7,00,8D,36,30,88,20,8C,
05,FF,26,F2,8E,06,00,A6,A0,A7,82
,8D,25,8C,05,E0,26,F5,8E,05,C0,A
6,A0,A7,00
100 DATA 30,88,E0,8D,14,8C,04,00
,26,F2,A6,8D,00,18,4C,81,04,26,0
1,4F,A7,8D,00,0E,39,81,BF,26,04,
31,8D,00,01,39
110 DATA 9F,AF,CF,BF
120 DATA 00
```

Program Listing 1. Border Pizzazz

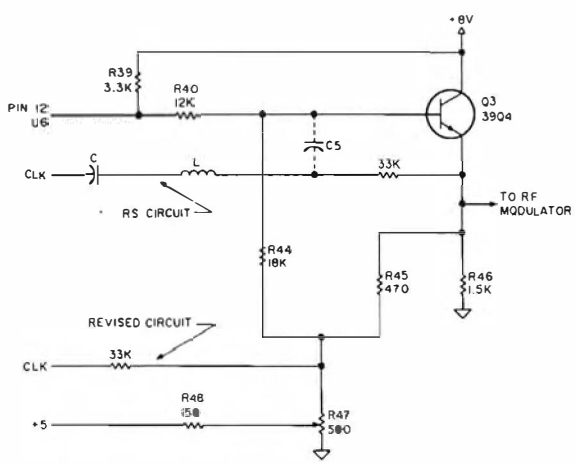

Fig. 1.
Composite Video Amplifier Showing Clock-Injection Revisions

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74LS 138 snapped off and I had to buy new chips. Here's a way to avoid all that aggravation.

Go to Radio Shack and purchase new low-profile IC sockets for each of the chips that you plan to modify. On the bottom of most of these sockets there are four tabs (one at each corner). Cut them off. Now wherever you had planned on bending a pin on an IC chip, just remove the corresponding pin from its new socket. Next plug the new socket piggyback into the original socket on the board. Solder all your jumpers at the top of the IC pins and then plug the chips back into the stacked sockets. I did this on an E board and there was plenty of clearance when I replaced the RF shield. Check for proper clearance before you try the modifications my way.

Peter D. Ryan
Dannemora, NY

Microline 92/CoCo Hookup

I use an Okidata Microline 92 with my Color Computer, and installed the serial card myself. Here are some tips on the process.

Follow the instructions that come with the card and be sure to check the jumper plug settings on the main control circuit board before mounting the serial card. Jumper plugs SP1 and SP2 should be set to the B side on the main board. Next, the card has 16 switches that you must set properly to select baud rate, parity, bit length, and so on. The switch settings for proper interface with the CoCo are as follows:

Switch	Setting	Switch	Setting
# 1	OFF	# 9	OFF
# 2	ON	# 10	OFF
# 3	OFF	# 11	ON
# 4	OFF	# 12	ON
# 5	ON	# 13	OFF
# 6	OFF	# 14	OFF
# 7	OFF	# 15	OFF
# 8	ON	# 16	OFF

Continuing with the serial card, set the jumper plugs as you did with the main control board. On the serial board there are three jumper plugs to set. Set all of these to the A side since this sends a printer-busy signal to pin #11 on the serial board. Note that the jumper location for side A or side B on the main board is not the same size as the serial board. For example, side A on the main board can be jumpered on the left side, while side A on the serial board will be jumpered on the right side of the pins. Both boards are clearly marked.

Next, set the switches that select character set, page length, and so on. These are located in front of the printer, inside near the control panel. The following settings are standard for the CoCo:

Switch	Setting	Switch	Setting
# 1	OFF	# 5	ON
# 2	ON	# 6	ON
# 3	OFF	# 7	OFF
# 4	ON	# 8	ON

Then carefully make your cable. I suggest a solderless, high-quality connector. On the printer side of the cable you will need a DB25 male with pins 6 and 20 jumpered together. On the CoCo side of the cable you will need an RS-232C connector with pin 1 (carrier detect) dropped.

That leaves three leads to connect to the DB25. First, pin 2 on the RS-232C goes to pin 11. Next, pin 4 goes to pin 3 on the DB25. Finally, pin 3 at the CoCo goes to pin 7 at the printer. The documentation and technical assistance offered by Okidata are excellent if you need further help.

Bobby Ballard
Brooklyn, NY

continued from page 79

indicates that you want the X register incremented by one, thereby preparing you for storing A in $481, and so on. You need to repeat this routine 32 times, so you create a loop that stores A at ever increasing X addresses, $481, $482, $483, and so on. The loop is controlled by counting down the B register, from 32 at the start to zero. DECB subtracts 1 from B each time through the loop. The BNE instruction means "branch to loop if B is not equal to zero" (Branch Not Equal). The looping ends when B becomes zero after 32 iterations.

The first and last lines are really directions to the assembler rather than compilable text. START and DONE are labels for single line modules; they have no real function except as locators. NAM is just a way of naming the program within the text. END tells the assembler that it has reached the end of the program.

Assemble the Program

Now go ahead and assemble the program that you have written in the editor. Here are the instructions to use with three of the more popular editor/assemblers:

To Assemble a Program

EDTASM +	*A /IM
SDS80-C	@LSM
MACRO 80-C	RUN"ASM

To Run the Machine Code

EDTASM +	#GINIT
SDS80-C	G
MACRO 80-C	LOAD"1:LINE" :EXEC

If you were lucky, the program ran without any glitches and displayed a black line on your screen. An infinite number of things can go wrong with Assembly-language programs. Did your program scramble the contents of the computer's memory, put red garbage on the screen, and turn on your tape recorder? Maybe something is wrong! Check the syntax of each line, including every # and $.

Interpreting a Listing of LINE/BIN

Take a look at Program Listing 1. What is all that stuff? Starting from the column on the left, you have:

- line numbers;
- address where stored;
- hex representation of instruction, data, or address (op code);
- label column;
- instruction or mnemonic representation;
- operand or argument that goes with the instruction; and
- comments for the line.

The second column clearly displays the memory locations for this program; LINE/BIN begins at $0E00 and ends at $0E0C. The third column groups the op codes for both the instruction and its operand or argument.

```
0001    0E00            START   NAM  LINE
0002    0E00 8680       INIT    LDA;  #128
0003    0E02 C620               LDB   #32
0004    0E04 8E0480             LDX   #$480
0005    0E07 A780       LOOP    STA   ,X +
0006    0E09 5A                 DECB
0007    0E0A 26FB               BNE   LOOP
0008    0E0C            DONE    END
NO ERRORS FOUND

DONE  0E0C  INIT  0E00  LOOP  0E07  START  0E00
```

Program Listing 1. Little Old Line Maker

On line 0002, LDA #128 requires 2 bytes: The op code for LDA is 86, and #128 is $80 in hex. This compound instruction, in other words, fills $0E00 and $0E01. Line 0003 begins with address $0E02.

The labels function as locators for both the humans and the assembler; hence, BNE LOOP means to branch back to the loop label at $0E07. At the bottom is the symbol table, a listing of the labels used and the addresses at which they were located. It, too, tells you that the program loaded at $0E00 and ended at $0E0C. ■

Address correspondence to Victor and James Perotti, 163-D Pine Grove Heights, Athens, OH 45701.

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The Learning Page

by Nancy Kipperman

Meeting the Computer Challenge

Educators are still struggling with the rightful place of the personal computer in the schools. "Computer literacy" is a term that seems to have many degrees of definition.

Are you "computer literate" if you recognize the place of computers in today's society, or if you can turn one on and know where to put the software and how to make it work? Are typing skills a prerequisite? Or must you be able to speak a computer language and write a program? Do you need to know Assembly language? Or is it enough just to have a basic (no pun intended) understanding of what is going on inside the machine?

Old Arguments

More and more, this question reminds me of old arguments about learning to drive. If I want to use a car to transport myself, isn't it enough that I learn driver education, understand the principles and maintenance of the gasoline engine, and perhaps know how to change a flat tire? I've never felt it necessary to have passed courses in automotive mechanics to be a competent driver. Certainly, it would be an advantage to know how to repair your own automobile, but in today's society, most of us don't have the time. However, if automobile mechanics is where your interest lies, that education is certainly available.

Now, the point I'm making is this: Computers in education are definitely stepping from the mechanics mode into the driver-education mode. More and more teachers look upon computers as tools to be used to achieve new levels of efficiency in teaching students how to handle real-life situations. There is less emphasis on programming and language and more on the use of software.

New Characteristics

Furthermore, educational software is developing new characteristics. Computer-aided instruction (CAI) was originally touted as the concept that would revolutionize today's education (or perhaps replace the teacher). For that to happen, every student would need constant access to a computer terminal—still a dream in most school systems. More important, every student would have to learn in the precise way in which a computer instructs.

Any competent teacher knows that one approach to teaching a concept to a group won't be effective with every student in that group. Each person has an individual learning style—a combination of visual and audio requirements necessary for learning.

After I introduce a new concept in a class, I can tell quickly by watching the students' faces and responses who has understood the material and who is lost. I, as the teacher, can then restructure my approach. The computer is, unfortunately, stuck with its program and unable to sense nuances in the students' understanding or reassess its attack.

Drill and Practice

Drill and practice is an area in which much software has been developed. In theory, it works well. A student immediately knows whether a response is right or wrong after completing each problem. No longer is there the frustration of copying 20 sentences or math examples, doing all the work, and then discovering that none of the answers is correct. Instant feedback with a positive note certainly should be an incentive to the student. In actuality, however, drill and practice is still drill and practice. It might be more fun and have a game format on a computer, but it's not an innovative method.

According to Ann Lathrop, editor of *The Digest of Software Reviews: Education*, "We are seeing a continuing decrease in number of reviews of the type of drill-and-practice programs frequently thought of as traditional CAI. The most frequently reviewed programs (in the 1984 edition) are those that encourage students to use computers as tools, are new simulations, and are programs that will help students develop better problem-solving and logical thinking skills."

Simulation Software

Simulation software can be simple or complex, but it requires the student to become involved. It teaches strategies, problem solving, team work, critical thinking, and logic by setting up a problem situation that must be solved. The Factory from Sunburst is a relatively simple simulation program that challenges you to make a variety of products using three different machines to modify a block of wood. You can choose to play against the computer to try to match the steps necessary to attain the computer's finished product, or you can play against another person.

Much more complex simulations are available for a variety of computers. Think how much safer it is to mix chemicals in a trial-and-error method on a computer screen than in an actual laboratory. In a computer simulation, results of certain actions can be shown to students, that's much more effective than telling them.

A college junior accounting major recently commented to me, "Learning to use a computer filing system and doing actual problems on computer spreadsheets instead of learning programming seems to have more value in my future and more relevance in my present curriculum." Colleges and universities are already heeding such comments; I predict that courses using the computer as a tool will crop up with increasing frequency on all levels.

Management Tasks

Software will also play an important part in the management of teachers' tasks in the classroom. You can efficiently keep grade reports, progress charts, and competency results on a computer tape or disk. Dr. Leigh Howard Holmes of the English Department at Cameron University, Lawton, OK, explains Follow 2, his theme commentary program, in the February 1985 issue of *The Computing Teacher*. It's a program that makes thorough comments on common mistakes on students' themes and produces a printout for them. The program is on cassette for a 64K Color Computer, and Holmes claims it reduces his grading time by at least 20 percent.

Looking Ahead

What's ahead for our children (and ourselves) in the quest for "computer literacy?" As far as educational software is concerned, I think it's programs that deal with issues that are important to students and that have real-life applications. It is programs that offer students something more than a teacher can provide in the everyday classroom. It is programs that have enough flexibility that students will not tire of them or use all the options too quickly. It is programs that use the computer as a tool to help students deal with the life-long process called education. ■

Nancy Kipperman is HOT CoCo's *Education Editor and an English teacher at Conant High School in Jaffrey, NH. Write her c/o* HOT CoCo, *80 Pine St., Peterborough, NH 03458.*

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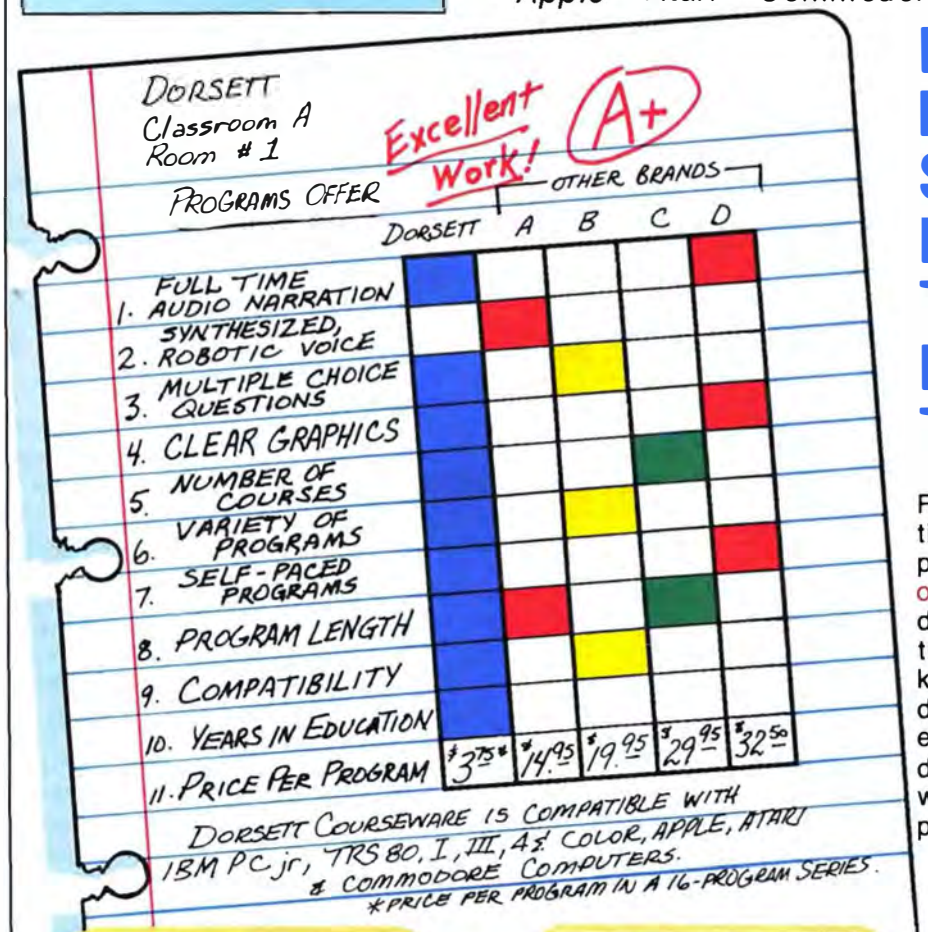
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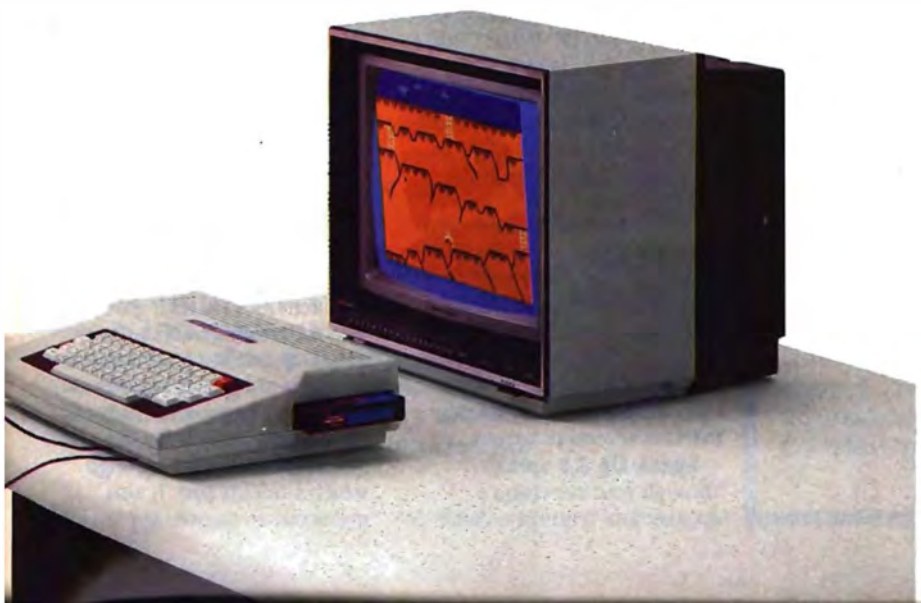

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Product News

by J. Scot Finnie

Child's Play, Dr. Words, Eagle, The Adventure Builder, ChessD, The Dallas Quest, Simon, Goldkeys, and More

Information printed in the Product News section is supplied by manufacturers. HOT CoCo has not tested or reviewed the products discussed here and cannot guarantee manufacturers' claims.

Although many of us are not yet fully aware of it, the Color Computer has a big following among kids, students of all ages, and educators. Tandy recently held a conference in Fort Worth, TX, for many of the Color Computer's educational-software vendors to explore the future of the education market. The results were positive. Almost every month, *HOT CoCo* hears of new educational products in the making. The first part of the column this month touches on some we've heard about lately.

CoCo Educating

TCE programs is an educational software company on the edge of a breakthrough. Its new program series **Child's Play** was developed to take up the slack in the junior- and senior-high-school markets where educators have begun to suspect that real-world applications, such as word-processing, spreadsheet calculating, and database management, are the ultimate goals of teaching computer familiarity in the schools.

Child's Play is a series of programs that perform business functions. **Child Writer** and **Memo Writer**, for example, are companion word processors. Child Writer uses on-screen menus and mouse technology. It has easy-to-use features for young users. As students learn and progress with Child Writer, they are preparing themselves for Memo Writer, which has several additional features. Both word processors require 32K, a disk drive, and a mouse or joystick. Child Writer sells for $44.95. Memo Writer sells for $49.95.

TCE has an upgrade policy that allows you to trade in your TCE software. You can send in your old software, the difference in price between the programs, and $7.50 to trade up to more expensive programs. Ted Malaska, one of TCE's team of teachers and software developers, stresses that the company also offers the **Network II Child Writer.** This program has the same features as Child Writer, but it can be networked. It sells for $59.95. Other Child's Play programs include **List Manager, Proofreader,** and **Master Proofreader.** The company also has several other Child's Play programs in the works.

Educational Micro creates educational software for the Color Computer and Apple markets. Their programs are designed to teach preschool through adult students how to spell, read, think logically, and perform math functions. The company markets several programs.

Speak Up 3.3 speaks through your television's speaker and requires no additional software. It comes in versions for 16K or 32/64K Color Computers and sells for $29.95 on cassette. **Dr. Words** and **Dr. Stan** use game formats to teach children and adults how to spell. They require 16K and sell for $47.95 on cassette and $49.95 on disk. **Harold's Castle** is a text-adventure game that helps teach reading comprehension and logical thinking for ages 10 and up. It is an educational program that can be used by the entire family. Harold's Castle requires 32K and sells for $22.95 on cassette and $24.95 on disk. Contact Educational Micro for more information.

Summer is just around the corner. For kids all over that means weeks of fun, exercise, and learning at summer camp are not far off. The American Camping Association (ACA) publishes an annual reference book for summer camps to help parents make the right decision in seeking out a summer camp for their children. The 1985 ***Parent's Guide to Accredited Camps*** has up-to-date information on more than 2,200 camps, including many computer camps. You can order it by sending a check or money order, calling the toll-free order line, or picking it up at the ACA office in your area. *Parent's Guide to Accredited Camps* sells for $8.95.

Creative Technical Consultants offers a host of educational computer programs that teach students of all ages everything from the alphabet to string variables. The company also sells programs that help teachers design activities for their students. **Word Search Puzzles,** for example, is a utility program that creates word-search puzzles on a printer. The program hides up to 40 words in an array with other random letters through which students sort. It also prints out an answer key to

Pick of the Month

The first question on our Reader Service card to the right asks you to pick your favorite article or feature in this issue. Write the appropriate letter in the space provided on the card. Here is the list to choose from:

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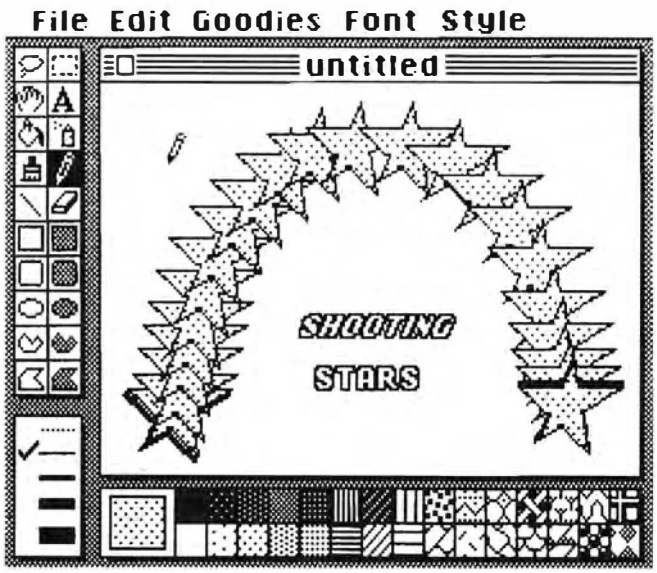
Coming Next Month

Hablas Pascal, C, Logo? Just as humans communicate in many different languages, your CoCo is capable of dialects other than Basic, too. And the **OS-9** operating system promises to make it easier than ever to use those programming languages.

In July, we'll provide overviews on the **Pascal, C,** and **Logo** programming languages. All three are gaining in popularity—Pascal and Logo in the classroom, and C in applications programming. Can they be better than Basic? Read next month's *HOT CoCo* to find out.

If you organize data on your CoCo, you know that sorting is very important in manipulating that data. Next month, **David Meredith** explores several different sorting methods in **"All Sorts Of Sorts"**. You can use his routines in your own programs, or use his advice in choosing your next database manager.

Like the feel of a soldering iron? **Jim Barbarello** returns in July with a new series. **"The John-B System"** is an interfacing project with an important angle. It can be used as a person-assistance system for disabled individuals, allowing them to control lights and electric appliances, compose text, or dial a phone. You can also adapt it for a home-security/control system.



CoCo Max, Colorware's Macintosh **emulator device,** is turning heads. Does it live up to its hoopla? See for yourself next month as **Scott Norman** gives you his impressions and side-by-side screen-dump comparisons of CoCo Max and Macintosh displays. ■

make grading easy. Word Search Puzzles requires 16K and Extended Color Basic. It sells for $10.95.

Creative Technical Consultants has also come up with a new way to demonstrate its programs to educators. The company will send a video-tape catalog of its programs for a 30-day evaluation to teachers and school officials who send a request for one on school letterhead. Contact the company for more information.

Games and Diversions

CoCo Max was the apple in the eye of several onlookers and buyers at the Rainbowfest in Irvine, CA, earlier this year. The graphics package from Colorware appears to be all its advertisements crack it up to be. Look for a conclusive review of CoCo Max in next month's issue of *HOT CoCo*. CoCo Max requires 64K, and a joystick, mouse, or graphics tablet. The package sells for $69.95.

Who shot J.R.? **The Dallas Quest** is a graphic-adventure game Radio Shack has just released that was written originally by Datasoft. The game has moving graphics and offers clues that you piece together to find a lost oil field. Radio Shack has released several new games in recent weeks. Two of these on Radio Shack store racks right now are **Desert Rider** and **FlightSim I.** The Dallas Quest requires 64K and sells for $29.95, Desert Rider requires 32K and sells for $29.95. FlightSim I requires 32K and sells for $24.95.

Saguaro Software has a new program that will send you to the Moon. **Eagle** is a lunar orbiter and lander whose thrusters and craft altitude you control with joysticks. The program displays horizontal and vertical velocities, acceleration values, vertical and horizontal distances from target, and fuel consumption on the screen. In the advanced levels, you'll encounter problems that cause dangerous approaches. Eagle requires 32K and two joysticks, It sells for $24.95 on cassette and $29.95 on disk. Contact Saguaro for more information.

Bill Cook, author of The Adventure Generator plans to release a new version of the program called **The Adventure Builder.** It will offer several improvements over its predecessor, including multiple sessions, the ability to reedit creations, scroll-protected split-screen outputs, and the capacity to create adventures that use more memory. The source for The Adventure Builder is Island Software. The program comes on disk and sells for $39.95 plus $3 for shipping. Write the company for more information.

Computer Systems Distributors has released **ChessD,** a challenging high-resolution chess game that offers special moves, including castle, en passant, and pawn promote. It also has a built-in tournament timer, a 32,000-move disk-opening book, and several other features. ChessD is manufactured by the same company that sells **SDOS, SD Basic Compiler,** and **SEdit/Type: Word Processing.** It requires 64K and a disk drive and sells for $49.95.

Computing Aids

Some interesting new devices and products hit the market this month. **Syntel** is selling a modem for the Color Computer that runs at 300/1,200 baud, has an originate-answer feature, a self test, and includes a modular telephone cable. The modem sells for $129.95. Contact Syntel for more information.

The Scotch division of 3M has announced a low-abrasive 5¼-inch disk-drive head-cleaning kit. The Scotch Disk Drive Head Cleaning Kit contains one reusable cleaning disk and 10 premeasured packets of Scotch cleaning solution. It sells for $11.99.

Plugging In: The Microcomputerist's Guide to Telecommunications is a new guide to the world of electronic communications. Author Sasha Lewis has created a reference work designed to help with the selection of hardware, software, and information services. *Plugging In* provides on-line examples of many private and public services, including CompuServe, The Source, and Dialog's Knowledge Index. The book sells for $11.95 in bookstores and is also available directly from the Chilton Book Company for an additional $1.75 for shipping.

Ones to Watch

Simon says, "Go ahead, make my day." **Simon** remembers every move you make on your keyboard in a Basic program. When you are through, Simon lets you store your keystrokes on disk. The next time you want to perform that routine, Simon can load in the keystrokes and do it for you. And Simon can remember as many as 6,000 keystrokes. Simon is produced by Derringer Software, makers of **Pro-Color-File** and many other programs for the Color Computer. It costs $24.95 plus $3 for shipping.

Vidtron, which created **Edittron,** has a new keyboard enhancer called **Goldkeys**. The software-based enhancer adds a type-ahead feature, 10 user-defined functions, and 10 predefined functions to your computer, among several other features. Goldkeys requires 64K and Extended Color Basic. It comes on cassette for $20 and disk for $22 plus $2 for shipping. ■

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CoCo for Hire

by Terry Kepner and Linda Tiernan

Statistical Data Compilation—Part II

Last month we began a discussion of statistical data-compilation services and how to start one, which is not as hard as it might sound. This month we conclude our look at this kind of work-at-home business with instructions for running one.

Tools of the Trade

Data-compilation businesses don't require a great deal in the way of hardware. A Color Computer and a printer are a good start. And either cassette- or disk-based systems will work. Your CoCo's memory should be 32 or 64K, preferably the latter. You can compile small surveys of a hundred or so responses in 16K (not including the memory required by your spreadsheet program), but for anything complex you need a larger memory capacity.

The disadvantage of cassette-based systems is that the software available for them often has fewer features. Some disk-based software lets you refer to data in spreadsheets stored on disk, allowing you to concatenate spreadsheets into a larger-than-memory whole. This is useful for projects with thousands of questionnaire responses.

You might want to consider the advantage of using OS-9 if you have a disk system. OS-9 gives you a larger selection of software with many helpful features, including the ability to print columns across several pages, which lets you tape sheets together for wide spreadsheets. Another desirable feature is access to printer codes. You might want to enable compressed printer fonts or special control features. It's also handy to be able to alter paper margins and vary the spreadsheet's column width for printing.

Look for the following spreadsheet features: the ability to insert and delete extra columns and rows within a working format, count the number of cells in a column or row that contains data, and find a minimum or maximum amount in a range of cells. Other features to consider include percentage calculation (often possible by combining other commands), summing and averaging, and graphing capabilities—particularly those that work with a printer.

Of prime importance for this application is a large number of columns and rows or the ability to refer to other spreadsheets for data—but these are hard to find. You will probably be using several spreadsheets for one analysis with a summary spreadsheet that takes all the subtotals and gives the final statistics.

Setting Up a Project

Begin a project by meeting with your clients. Try to be in on the planning session of a survey. You have a better idea of equipment limitations than your clients do and they know what questions they want answered. Bear in mind that the more objective the questions are, the easier the answers will be for you to compile.

There will be an interval of time between the completion of the final drafts of the questionnaire and the point when the responses are ready for compilation that does not involve you. Recommend a specific return date for the survey. That means saying August 15 instead of "90 days from the receipt of this form. . . ."

When you have the finished questionnaires in hand, examine the responses for each question to see how well the multiple-choice answers worked. For example, did many people write in their own response, such as "never heard of it," to any of the questions? If so, you might want to add that response as a category on your spreadsheet. Whenever responses indicate possible revisions to your format, check with your clients to be sure you are providing what they want.

Once you have reviewed the questionnaires and your format to be sure that they are consistent, start typing in the data. This is tedious, but you'll soon get into a rhythm. When you reach the end of the pile, start the calculations. Use the spreadsheet to sum each column, count the number of respondents, figure percentages and totals, and put all these figures in the appropriate places at the bottom, top, or sides of the spreadsheet. When this is done, print out the form and inspect the data and formulas. You might find errors on paper that you missed on the screen, such as a slash instead of a one or a summation that starts a few cells too low or continues a few cells too far.

It is important that your spreadsheet equations are correct and that you have properly transcribed all the questionnaire data. Errors are unacceptable because they might alter the conclusion of an analysis. Someone's job or a corporation's budget could be ruined by a simple error of omission.

Policy

It is important to maintain discretion with a statistical data-compilation business. Data you receive from your customers often represent information collected in confidence. Never mention previous or current clients (without written consent) or reveal any of their data, even to prospective customers. Some clients might ask you to sign a nondisclosure agreement or a confidentiality paper. Most states don't consider these legally binding, but it is the gesture that matters. For a highly confidential job, a long-term position, or one involving large amounts of money, your client might ask that you be bonded, a form of insurance that guarantees your reliability and integrity. If your prospective client foots the bill for bonding, you should accept it. Being bonded will open the door to other similar and possibly lucrative jobs.

Part of maintaining confidentiality is turning over to clients all materials that contain their data, including disks and cassettes. An-

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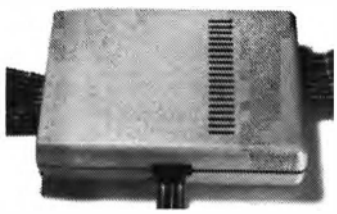

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other option for magnetic media is bulk erasing, which requires a relatively inexpensive tool called a bulk eraser that is designed to wipe your disks and cassettes clean of data. If you give your data-storage materials to your clients, you might want to consider using an encoding program to prevent anyone else from using the data and spreadsheet templates you develop. This also ensures that your clients will return to you if they want to reexamine the data.

Billing is another area of a statistical-compilation service for which you must set and strictly adhere to a policy. Be stern with yourself and your clients. If you charge for an hour, be sure that you have done an hour's work. Itemize your bills: Show your customers that you worked for x amount of hours analyzing format, y amount of hours setting up format, z amount of hours inputting data, w amount of hours printing, and so on. This detail gives your customers a clear understanding of the service you provide for their money.

Remember not to step out of your role as an intermediary. Most people dislike statisical work. If you offer to do too much of the groundwork, you might find yourself in charge of the project. If a customer wonders why you can't add three more questions to a questionnaire that has already been printed, spell out the reason or find a way to add the questions for an extra charge. Don't waste time on side issues and extra work. The biggest pitfall in statistical compilation is taking on more than you can manage. For a survey, put in a bid for making all the questions objective with multiple-choice answers. Advise your clients to leave one question or section where respondents can address things the questionnaire neglects.

When you compile a survey, do the sums, averages, displays, and whatever else your customer asks for, but don't write a summary paragraph or conclusion. The wording of the conclusion of a statistical analysis often determines its interpretation. Your clients will want to do this themselves. But it is important at the outset for you to know what your clients are looking for so that you don't spend several hours working on insignificant side issues. ■

Address correspondence to Terry Kepner, P.O. Box 481, Peterborough, NH 03458. Terry Kepner is a free-lance writer and programmer. He also writes monthly columns for 80 Micro *and* Portable 100 *magazines. He has been writting about computers since 1979. Linda Tiernan is a librarian with a master's degree in bio-medical research. She has worked with computers since 1980.*

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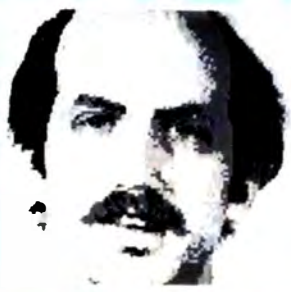

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CoCo Max

This is one of those rare programs that will captivate everyone in your family.... No one can see CoCo Max and not want to try it!

We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.

UNMATCHED CAPABILITY...

Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. It's unrivaled performance lets you create with more brilliance and more speed than any similar system – much more than you ever imagined possible. And, you can do it in black & white or color.

All the sophisticated power of the bigger systems is there: ***Icons, Pull-Down Menus,*** full ***Graphic Editing, Font Styles,*** and all kinds of handy tools and shortcuts.

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple ***Point-and-Click*** method to get any of CoCo Max's powerful graphic tools. It has them all:

You can ***Brush, Spray*** or ***Fill*** with any ***Color, Shading*** or ***Pattern.*** Use ***Rubber Band Lines*** and ***Shapes*** (square, rectangle, circle, elipse, etc.) to create perfect illustrations with speed and ease. There's a ***Pencil,*** an ***Eraser*** and even a selection of ***Caligraphy Brushes.*** And, as you can see, CoCo Max can do a lot with text. All of the newest special effects are there: ***Trace Edges, Flip, Invert, Brush Mirrors,*** etc. And all of the very latest supercapabilities like: ***Undo,*** which automatically reverses your mistakes, and ***Fat Bits*** which zooms you way in on any part of your subject to allow dot-for-dot precision.

THE BIG PICTURE

The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-½ times the area of the window itself.

FLEXIBLE PRINTING...

CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than ¼ page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to ⅛ page size.

THE COCO MAX SYSTEM

FREEDOM TO CREATE...

Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,

graphs, and computer art – for serious use or just for creative fun.

tion by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

Plug your same joystick, mouse or touch pad into this new input and you have a whole new kind of control. The difference is remarkable.

AN ABSOLUTE GUARANTEE

CoCo Max is a hardware software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

THE HARDWARE...

This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen

has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen.

Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limita-

A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.

You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from $149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.

COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y Branching Cable.

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The Corner Office

by Jeff DeTray, Publisher

All About You

We're constantly surveying you, the *HOT CoCo* reader, to find out what you think of our magazine. Your opinions on content, readability, and appearance are important. At the same time, we've gathered considerable information concerning the hardware you own and your favorite applications. In the process, we've also learned a great deal about you as people. This month, I'd like to share some of our findings with you.

The "Average Reader"

HOT CoCo readers are anything but average, if that word is taken to mean unexceptional or mediocre. Perhaps the term I want is "composite". We can create a composite sketch of a typical *HOT CoCo* reader by combining the various bits of demographic information we have collected. Let's take a close look at this nonexistant Composite CoCo Fan, (or CCF for short). While it's highly unlikely that you fit the CCF profile exactly, it can still be fun to discover where you do and don't match the averages.

How old are you? Our CCF is 32 years old, but remember, that's only an average. The actual spread of ages is quite wide, from grade school students to retirees. While 39 percent of our readers are over the age of 35, the under-25 crowd hangs right in there with 31 percent. I'm starting to feel old. In summary:

25 and under	31%
26–35	30%
over 35	39%

The effects of such a broad range of ages can be seen in the two most popular occupations of *HOT CoCo* readers. The CCF is either a student or is pursuing a technical or engineering career. General business and government jobs are also high on the list. More than 75 percent of you fall into one of these four occupational categories. Even so, occupations still run the gamut, from farmers to factory workers to doctors to sales reps. People of all sorts are using Color Computers. Nobody mentioned publishing—does that mean I don't match the profile?

The CCF is a college man. A whopping 56 percent of you have attended college. That's especially impressive considering the many readers still in grade school and high school. All that education must be doing some good, as the income of the average *HOT CoCo* household stands at $32,400!

The "Average" Color Computer

This is a tough one to pin down, because it's changing so rapidly. What's exceptional today will be the norm tomorrow. For instance, as Mike points out in this month's Digressions, 64K is rapidly giving way to 128K as the standard memory capacity for home computers. Indeed, almost 70 percent of you already own 64K Color Computers, so there's no place to go but upwards to 128K. The 16K crowd still comprises a healthy 23 percent of our readers, so rest assured there will still be plenty of 16K goodies in *HOT CoCo*. Extended Basic or Disk Basic can now be found in more than 90 percent of your machines.

Disk drive ownership is rapidly approaching 50 percent, and many of you without disks have plans to purchase one. Printers are even more popular—over 60 percent of you own at least one. Most of you without a printer have plans to acquire one by year's end. Modems are growing fast in popularity, as interest grows in communicating with electronic information services and computer bulletin boards. Look for modem usage among Color Computer owners to double this year.

What's the most popular CoCo peripheral of all? No contest. It's joysticks, by a wide margin, with an 85 percent ownership. And you say you never play games!

'Til Next Month

Let me hear from you, okay? How do you like the new look of *HOT CoCo*? What about the pull-out program listings in the center of the magazine? Do you like Scott Norman's new column, The Computer Room? Or Assembly 101 by the Perottis, father and son? Don't sit on your hands—write to us, or drop a note on CompuServe 70310,676.

Have a good month, and don't forget to tell advertisers, "I saw it in *HOT CoCo*!" ■

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